

FORENSIC LATENT PRINT IDENTIFICATION UNIT



TEST METHODS

INDIANA STATE POLICE FORENSIC LATENT PRINT IDENTIFICATION UNIT TEST METHODS

FORWARD

The Forensic Latent Print Identification Unit of the Indiana State Police Laboratory Division has the responsibility of conducting forensic examinations, which relate to the examination and comparative analysis of latent prints, including friction ridge skin impressions, footwear impressions, and tire track impressions. Articles of evidentiary value are processed for development of latent print impressions. Latent prints are preserved by photography and/or latent lifts which are then either compared to known exemplars or searched through an unknown database (e.g. AFIS and SICAR®/Tread Assistant). This service is provided to criminal justice agencies at no cost to the contributor.

The Forensic Latent Print Identification Unit is staffed with highly trained and skilled examiners with academic backgrounds in the physical sciences, criminal justice, or other related studies. Additionally, these forensic examiners have participated in an extensive formalized training program dealing specifically with the current techniques for latent print development and comparison. At the completion of this training program, each examiner will have successfully completed a competency testing procedure made up of written tests, oral examinations, proficiency sample analyses, and mock court testimony.

The body of knowledge which comprises forensic science is a compilation of procedures adapted from other disciplines that encompass many of the physical and natural sciences. During the history of forensic science, a multitude of individuals have greatly contributed to the protocols, methods and procedures that have become a routine part of analysis. All noted references contained in this document are a starting point and should not be considered an all-inclusive list.

This test method document is a general approach to the examination of latent friction ridge, footwear, and tire track impressions and the results as they relate to these examinations. On the rare occasion where previously worked items of evidence are re-examined due to a supplemental request, such as a court order or the opening of a cold case, the current test methods shall be utilized. Alternative procedures, other than those listed, may be employed with the approval of a Unit Supervisor.

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Friction Ridge Comparison Method:

- 1.1. **Scope:** This method defines the procedures and techniques that are routinely used in the examination of evidence for friction ridge impressions. Friction ridge examinations are conducted using the Analysis, Comparison, Evaluation, and Verification (ACE-V) Methodology, utilizing both qualitative and quantitative analysis.
- 1.2. **Precautions/Limitations:** Friction ridge impressions may not be developed and if/when they are developed, they may or may not be identifiable. There are many factors that affect the development of a friction ridge impression which is suitable for identification and/or exclusion. These include:
 - 1.2.1. **Matrix:** The matrix (substance) on the friction ridge skin varies along with the amount of matrix on the friction ridge skin. Too much or not enough matrix can result in a low quality and/or low quantity friction ridge impression.
 - 1.2.2. **Pressure:** The amount of pressure applied to an object (deposition pressure) when it is touched by the friction ridge skin can cause distortion of the friction ridge skin, which can result in a poor quality impression. In addition, if there is pressure from the side (lateral pressure), the result can be smearing or smudging of the friction ridge impression.
 - 1.2.3. **Substrate:** The surface (substrate) that the friction ridge skin is coming into contact with affects the quality of the impression. Rough or highly textured surfaces are not conducive to friction ridge impression development.
 - 1.2.4. **Handling:** If the object is handled after it has been touched, it can result in friction ridge impressions being destroyed.
 - 1.2.5. **Environment:** If the object is subjected to various environmental conditions after or during the deposition of friction ridge impressions, the impressions may be destroyed.
- 1.3. **Related Information:**
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- 1.6. **Hazards/Safety:**
 - 1.6.1. All Latent Print personnel are advised to utilize appropriate safe work practices when handling chemicals and solvents used in latent print processing procedures. Safe work practices include:
 - 1.6.1.1. Wearing personal protective equipment (PPE) such as gloves, laboratory coat, eye protection, etc. when handling any chemicals.
 - 1.6.1.2. Making sure that all engineering controls such as ventilation hoods, chemical storage cabinets, etc., are used properly.
 - 1.6.1.3. Employing clean work habits, such as washing hands after the preparation of chemical solutions (even though gloved).
 - 1.6.1.4. No eating or drinking in the analytical work areas of the laboratory.

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1.6.2. Specific hazards regarding chemicals and other processes are outlined within the Processing Manual ([Appendix 8](#)).

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1.7. Reference Materials/Controls/Calibration Checks:

1.7.1. AFIS and IAFIS

1.7.1.1. The Automated Fingerprint Identification System (AFIS) is an instrument that can be used to search the State of Indiana database of known fingerprints and palm prints.

1.7.1.1.1. The Indiana State Police AFIS is maintained, operated, and tested by the AFIS Coordinator in the Indiana State Police Records Division.

1.7.1.1.2. The individual characteristic database samples are to be considered reference materials that are uniquely identified with a State Identification Number (SID) or Latent Key Number.

1.7.1.2. The Integrated Automated Fingerprint Identification System (IAFIS) is an AFIS used to perform searches of the Federal Bureau of Investigation's (FBI) known fingerprints and palm prints.

1.7.1.2.1. This system is housed and maintained by the FBI. Known fingerprints and/or palm prints of persons are received, searched, and stored in this system and are available for searching.

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1.7.1.3. AFIS terminals shall be kept in a secured area, and each analyst shall have their own password to access the AFIS/IAFIS software.

1.7.2. Controls for each processing method are outlined in the Processing Manual ([Appendix 8](#)).

1.7.2.1. Light Based Methods

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1.7.3. Calibration checks for instruments and equipment are outlined in the Instrument Calibration and Maintenance Manual ([Appendix 9](#)).

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1.8. Procedures/Instructions:

1.8.1. Procedures to Prevent DNA Contamination

1.8.1.1. Personal protective equipment (PPE) shall be worn when an item is open that is also to be examined by the Biology Unit.

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PPE includes a closed/buttoned lab coat, gloves (Nitrile or equivalent), and a face mask (covering nose and mouth).

- 1.8.1.2. The analyst's lab coat, gloves, and face mask shall be changed as needed to prevent contamination.
- 1.8.1.3. The analyst should choose the best work area for their examination, and the work area shall be cleaned with a 70% Ethanol or 5% dilution bleach solution both prior to and after each item is examined.
- 1.8.1.4. All instruments/tools/writing utensils shall be cleaned with a 70% Ethanol or 5% dilution bleach solution both prior to and after each item is examined.
- 1.8.2. Common Sources of DNA Contamination
 - 1.8.2.1. The analyst touches their skin with their gloves.
 - 1.8.2.2. The analyst touches/adjusts their eyeglasses.
 - 1.8.2.3. The analyst touches/uses pens, markers, or reagent bottles that have not been decontaminated.
 - 1.8.2.4. The analyst's lab coat is dirty, and the analyst touches the lab coat with their gloves.
 - 1.8.2.5. Another analyst or person is in the examination area without PPE.
 - 1.8.2.6. An analyst is talking around the evidence without wearing a face mask.
- 1.8.3. Combined Latent Print/DNA Examination Requests
 - 1.8.3.1. The Biology Unit should analyze the item first whenever possible.
 - 1.8.3.1.1. If the latent print examination is completed first, ensure all previously mentioned PPE and cleaning procedures are followed.
 - 1.8.3.1.2. If the latent print examination is completed first and the Biologist is screening for e-cells, then it is recommended not to process with any wet chemistry. However, cyanoacrylate and powdering are acceptable on non-porous items.
 - 1.8.3.2. When the item is in the possession of the Biologist and the item *has* a Latent Print Examination Request:
 - 1.8.3.2.1. If the Latent Print Analyst looks at the item and there are no suitable surfaces for latent print development or if there are no latent prints found, the Latent Print Analyst shall write a report for the item.
 - 1.8.3.2.2. If the Latent Print Analyst looks at an item and there are suitable surfaces for latent prints or there are latent prints visible, the Latent Print Analyst shall consult with the Biologist on where to collect biological samples. When possible, hand to hand transfer of the evidence in an unpackaged condition shall be conducted in order to help prevent damage to any latent prints. The Biologist can repackage the item to preserve it for latent print analysis. Then,

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- after the full latent print examination, the Latent Print Analyst shall write a report for the item.
- 1.8.3.3. When the item is in the possession of the Biologist and the item *does not* have a Latent Print Examination Request:
 - 1.8.3.3.1. If the Latent Print Analyst looks at the item and no latent prints are found, then the Latent Print Analyst may create a latent print examination request in LIMS-Plus® JusticeTrax® and write a report for the item.
 - 1.8.3.3.2. If the Latent Print Analyst looks at the item and there are suitable surfaces for latent prints or there are latent prints visible, the Investigator shall be contacted to determine if a latent print examination is probative to the case. Communication with the Investigator shall be disseminated in LIMS-Plus JusticeTrax. If the latent print examination is probative, then the Latent Print Analyst shall create a latent print examination request in LIMS-Plus JusticeTrax and after the full latent print examination, write a report for the item.
 - 1.8.3.4. When the item is in the possession of the Latent Print Analyst and the item *has* a Biology Examination Request:
 - 1.8.3.4.1. If the Biologist looks at the item and there are no visible biological stains, the Biologist is responsible for writing a report for the item.
 - 1.8.3.4.2. If the Biologist looks at the item and there are biological stains or possible biological stains, the Biologist is responsible for writing a report for the item after the full biology examination.
 - 1.8.3.4.3. Alternatively, the Latent Print Analyst may swab the item themselves and make the swab a sub-item.
 - 1.8.3.5. When the item is in the possession of the Latent Print Analyst and the item *does not* have a Biology Examination Request:
 - 1.8.3.5.1. If the Biologist looks at the item and there are no visible biological stains, no further action is required.
 - 1.8.3.5.2. If the Biologist looks at the item and there are no biological stains, but the Biologist used an analytical process or chemical test, then the Biologist is responsible for creating a biology examination request in LIMS-Plus JusticeTrax and writing a report for the item.
 - 1.8.3.5.3. If the Biologist looks at the item and there are biological stains or possible biological stains, the Investigator shall be contacted to determine if a biology examination request is probative to the case. Communication with the Investigator shall be disseminated in LIMS-Plus JusticeTrax. If the biology examination is probative, then the Biologist is

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responsible for creating a biology examination request in LIMS-Plus JusticeTrax and after the full biology examination, writing a report for the item.

- 1.8.3.5.4. If a situation arises that does not fit one of the previously listed scenarios, consult with a Unit Supervisor or Laboratory Manager.

1.8.4. Combined Latent Print/Firearms Examinations

- 1.8.4.1. The Latent Print Analyst should, when possible, examine the item first.
- 1.8.4.2. Prior to conducting any part of the latent print examination, the Latent Print Analyst shall ensure that the firearm is safe. If there is any question as to the safety of the firearm, a Firearms Analyst shall be contacted.
- 1.8.4.3. Due to the potential of Cyanoacrylate fumes to affect the functionality of the firearm, any openings on the firearm shall be covered with tape prior to Cyanoacrylate fuming.
- 1.8.4.4. Due to the potential of wet chemicals to affect the functionality of the firearm, a firearms analyst shall be consulted prior to any wet chemical processing.
 - 1.8.4.4.1. If wet chemical processing is deemed necessary and the Firearms Analyst approves the use of wet chemicals, the Latent Print Analyst shall limit the area affected by the use of wet chemicals.
- 1.8.4.5. Due to the potential of wet chemicals to affect the gun powder inside unfired cartridges, a Firearms Analyst shall be consulted prior to any wet chemical processing.
- 1.8.4.6. In some circumstances, it may be beneficial to remove the grips of the firearm for latent print processing. Prior to the removal of any grips from a firearm, a Firearms Analyst shall be contacted.
- 1.8.4.7. If the Latent Print Analyst chooses not to mark cartridges for identification, this shall be stated in the case notes.
- 1.8.4.8. If any additional questions arise as to the proper sequence for examination or to the proper protocols for combined examinations, consult with a Unit Supervisor or Laboratory Manager.

1.8.5. Combined Latent Print/Documents Examinations

- 1.8.5.1. The Document Unit should, when possible, examine the item first.
- 1.8.5.2. If a paper item that contains handwriting is submitted for latent print examination, but there is not a document examination request, the handwriting should be preserved through a scanned image (i.e. PDF or TIFF format). If the digital scanned image is in PDF file format, it shall also be uploaded into LIMS-Plus JusticeTrax.
 - 1.8.5.2.1. Note: Chemical processing will destroy indented writing impressions present. If indented impressions are observed, contact the Documents Unit.

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- 1.8.5.3. If any additional questions arise as to the proper sequence for examination or to the proper protocols for combined examinations, consult with a Unit Supervisor or Laboratory Manager.
- 1.8.6. Combined Latent Print/Drug Chemistry Examinations
 - 1.8.6.1. If an item contains substances to be examined by the Drug Chemistry Unit for controlled substances, the controlled substance should be separated from the packaging prior to submission to the laboratory. However, if an item has been submitted without being separated, a drug chemist should be contacted to assist in the separation of the substance from the packaging.
 - 1.8.6.2. If any additional questions arise as to the proper sequence for examination or to the proper protocols for combined examinations, consult with a Unit Supervisor or Laboratory Manager.
- 1.8.7. Combined Latent Print/Trace Examinations
 - 1.8.7.1. If an item is submitted for latent print examination as well as a physical comparison or fracture match examination, the Trace Analyst or other qualified Analyst shall be contacted to determine who should examine the item first.
 - 1.8.7.2. If an item is submitted for latent print examination which contains material that is to be analyzed by the Trace Unit, a Trace Analyst shall be contacted to determine if the material is safe and if the material should be separated from the item.
 - 1.8.7.3. If any additional questions arise as to the proper sequence for examination or to the proper protocols for combined examinations, consult with a Unit Supervisor or Laboratory Manager.
- 1.8.8. Examination and processing of evidence for the presence of friction ridge impressions should be completed according to the Processing Manual ([Appendix 8](#)).
 - 1.8.8.1. Oil Red O/Physical Developer is not required, except in the case of thermal paper, and may be used at the discretion of the analyst.
- 1.8.9. The Analysis phase of ACE-V Methodology is the assessment of a friction ridge impression to determine its suitability for comparison. The value of friction ridge impressions is assessed according to the quality and quantity of detail they possess. Quality (clarity) and quantity (amount) of detail may be influenced by the anatomical source (finger, palm, etc.), condition of the friction ridge skin, type of matrix, deposition factors, substrate considerations, environmental factors, development mediums, and preservation methods.
 - 1.8.9.1. Level One Detail consists of overall ridge flow and pattern configuration. Level one detail may include information enabling orientation and can be used to determine anatomical source (i.e. finger, palm, foot, etc.). Level one detail also includes general morphology (e.g., presence of incipient ridges and overall size).

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Level one detail cannot be used alone to individualize but may be used to exclude.

- 1.8.9.2. Level Two Detail consists of the individual ridge path, presence or absence of ridge path deviation (ending ridge, bifurcation and dot or continuous ridge), and ridge path morphology (e.g., size and shape). Level two detail is used in conjunction with level one detail to individualize or exclude.
- 1.8.9.3. Level Three Detail is confined to small shapes on individual ridges, relative pore positions, and other specific skin morphology (e.g., secondary creases and ridge breaks). Level three detail is used in conjunction with level one and two detail to individualize or exclude.
- 1.8.9.4. Other features associated with friction ridge skin (e.g., creases, scars, warts, paper cuts, blisters) may also be considered. These features may be permanent or temporary and exist as level one, two, or three detail. These other features may be used by themselves or in conjunction with friction ridge detail to individualize or exclude.
- 1.8.9.5. Impressions deemed "suitable for comparison" contain sufficient ridge detail to warrant a comparison in the opinion of the analyst. If there are impressions deemed "suitable for comparison" either:
 - 1.8.9.5.1. Proceed to the comparison step if there are known exemplars. Once comparison to known exemplars is completed, any remaining AFIS quality, unidentified latent prints may be entered into AFIS, or
 - 1.8.9.5.2. Proceed to AFIS entry if they are AFIS quality and there are no known exemplars.
- 1.8.9.6. Impressions that do not contain sufficient detail to warrant a comparison in the opinion of the analyst are deemed to be "no value." This conclusion is noted as such in the case notes.
- 1.8.10. The Comparison phase of ACE-V Methodology is the side-by-side observation of friction ridge detail to determine whether the information between two impressions is in agreement or disagreement based upon similarity, sequence, and spatial relationship of friction ridge characteristics.
 - 1.8.10.1. The analyst systematically searches the known exemplars in an effort to exclude them as a source or to locate a known impression that is consistent with the detail observed in the unknown print during analysis.
 - 1.8.10.2. Comparison is conducted in an objective manner beginning with the unknown (or impression of poorest quality) and comparing to the known (or impression of better quality).
 - 1.8.10.3. Deferred/Limited Comparisons
 - 1.8.10.3.1. Upon approval from the contributing agency and the Unit Supervisor, comparisons may be deferred/limited due to the circumstances of that specific case.
 - 1.8.10.3.1.1. All items of evidence submitted in the case must be processed/examined, and all latent

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prints developed/observed shall be preserved for possible future examination.

- 1.8.11.** The Evaluation phase of ACE-V Methodology is the formulation of a conclusion based upon the sufficiency of detail observed during the analysis and comparison of friction ridge impressions. Sufficiency of detail is based on the analyst's training and experience and is defined as being the determination that there is adequate quality and quantity to reach a conclusion. Conclusions that may be reached are Identification (Individualization), Exclusion, or Inconclusive.

1.8.11.1. Identification (Individualization) is reached when both the unknown and known impressions are in agreement and contain sufficient friction ridge detail in sequence having detectable uniqueness so that the likelihood the impression was made by another source is so remote that it is considered as a practical impossibility.

1.8.11.1.1. No two impressions will ever be exactly the same in *all* respects. Variance in appearance can occur as a result of distortion, slippage, twisting, printing defects, overlapping prints, etc.

1.8.11.2. Exclusion is reached when the impressions being compared are in disagreement or contain a difference in characteristics or features.

1.8.11.3. Inconclusive findings result from the absence of sufficient friction ridge detail (lack of quality or quantity) to effect a conclusion of identification or exclusion. Inconclusive findings may also be attributed to the absence of a comparable area in the known exemplar. Inconclusive findings are often reported as "no identification or exclusion was made," and is followed by a reason why the result is inconclusive.

- 1.8.12.** The Verification phase of ACE-V Methodology is the independent application of ACE Methodology by another qualified analyst.

1.8.12.1. A qualified analyst shall verify all latent print identifications and exclusions. A qualified analyst is one who has successfully passed the Indiana State Police Latent Print Training Program and has been released from supervised casework. Analysts shall not use one verifier exclusively.

1.8.12.1.1. Note: Identification implies that all other sources are excluded from having made the impression; therefore, verifications of exclusions of an identified print are unnecessary.

1.8.12.2. AFIS/IAFIS Hits

1.8.12.2.1. If a case has a single identification which has resulted from an AFIS or IAFIS inquiry, that identification shall be verified by two qualified analysts.

1.8.12.3. Resolution of a Technical Variation and/or Conflict

1.8.12.3.1. In the event that there is a technical variation or conflict of opinion during the verification phase, the

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Unit Supervisor shall be notified. If a resolution cannot be reached, then the procedures in the Indiana State Police Laboratory Quality Assurance Manual shall be followed. The analyst shall not seek a second reviewer.

1.8.13. Determining AFIS/IAFIS Entry Suitability

1.8.13.1. All unidentified latent prints that are suitable for comparison and are deemed to be AFIS quality should be searched through the AFIS and IAFIS databases. Exceptions may be made based upon friction ridge area suitability and case information, and shall be properly documented in the case notes. Exceptions may include, but are not limited to:

1.8.13.1.1. Latent prints that lack an indication of a core and/or delta.

1.8.13.1.2. Latent prints that lack sufficient level 2 detail.

1.8.13.1.3. Latent prints in which the orientation cannot be determined.

1.8.13.1.4. Latent prints that depict friction ridge skin from the tips of the fingers, extreme sides of the fingers, and/or the medial and proximal phalanges.

1.8.13.2. If there are latent prints that are observed on the edge of a lift and appear to be the lifting officer's prints, then call the officer to inquire on the use of gloves. Communication with the officer shall be documented in the case notes.

1.8.13.2.1. If the lifting officer confirms that he did not wear gloves, then AFIS entry is not needed.

1.8.13.2.2. If the lifting officer says that he did wear gloves, then the latent prints suitable for AFIS entry shall be entered into AFIS.

1.8.13.2.3. If the lifting officer does not return your phone call or cannot remember if he wore gloves, then request his elimination exemplars. If elimination exemplars are not received within a week, then defer entering the prints into AFIS and request the lifting officer's elimination exemplars on the Certificate of Analysis.

1.8.14. AFIS Entry

1.8.14.1. When searching latent prints in the AFIS database from a case that does not have special circumstances (i.e. ten print to ten print, post mortem prints identification), a Latent Fusion and/or Latent Inquiry Combination (LI combo) shall be executed.

1.8.14.1.1. At a minimum, latent prints searched in the AFIS database should include a Latent Inquiry, a Latent to Latent Inquiry, and be registered.

1.8.14.2. Reference NEC online instruction/help manual from the AFIS terminal for detailed information.

1.9. Records: Documentation shall be to the extent that another qualified analyst would be able to determine each examination activity conducted, their sequence, results of

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the activities, and any conclusions reached. The start date is when the evidence is unsealed and/or inventoried, which is recorded in the history trail within Mideo Caseworks. The end date is when the case is submitted for technical or administrative review, which is recorded in the milestone history trail within LIMS-Plus JusticeTrax. Although all examinations require documentation, the extent of the documentation is related to the complexity of the examination. Documentation shall be made contemporaneous to the time of the examination. Most documentation relating to the examination of latent prints will be conducted within Mideo Caseworks. The following documentation shall be considered a part of the case file.

1.9.1. General Information

- 1.9.1.1. Analyst's name
- 1.9.1.2. Laboratory case number
- 1.9.1.3. Page numbers
- 1.9.1.4. Dates of work performed

1.9.2. Description of the Evidence

- 1.9.2.1. Documentation of each Item of Evidence shall include:
 - 1.9.2.1.1. A description of the packaging (e.g. brown paper bag, cardboard box).
 - 1.9.2.1.2. Condition of the packaging (e.g. sealed, broken seal, damaged).
 - 1.9.2.1.2.1. If there is an issue with the packaging, a Unit Supervisor or Laboratory Manager shall be notified.
 - 1.9.2.1.3. A description of each item and the number of items.
 - 1.9.2.1.4. An overall photograph of the item(s) should be uploaded into the Evidence folder or attached to the respective Processing Data Icon in Mideo Caseworks or a scanned image can be used as documentation instead of a photograph.
 - 1.9.2.1.5. The pertinent information on the outside packaging shall either be written down or photographed. Photographs shall be uploaded into the Overall folder in Mideo Caseworks.

1.9.3. Documentation of Lifts Submitted to the Laboratory for Examination

- 1.9.3.1. Each lift shall be marked for identification with the analyst's initials, case number, and laboratory item number. Each lift should be marked for identification prior to scanning for documentation purposes.
- 1.9.3.2. Each latent print suitable for comparison shall be labeled either on the lift itself or on the scanned image of the lift.
- 1.9.3.3. Each lift shall be scanned and uploaded into the Lifts folder in Mideo Caseworks for preservation.
- 1.9.3.4. The information on the back of every lift shall be recorded in the case notes or the back of the lift shall be scanned and uploaded into the Additional Documentation folder in Mideo Caseworks except for the back of lifts that are blank.

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- 1.9.3.4.1. If the scan of the lifts is in PDF file format, it shall also be uploaded into LIMS-Plus JusticeTrax. The image(s) of the back of the lifts shall be clearly labeled to correspond with the image(s) of the front of the lifts.
- 1.9.4. Documentation of Photographs Submitted to the Laboratory for Examination.
 - 1.9.4.1. Digital Photographs
 - 1.9.4.1.1. Document the serial number of the CD, DVD, etc.
 - 1.9.4.1.2. Mark the CD, DVD for identification with the analyst's initials, case number, and laboratory item number.
 - 1.9.4.1.3. Document the file format of the photographs (JPEG, TIFF, RAW, etc.).
 - 1.9.4.1.4. If there are multiple photographs of the same latent print, document which latent prints are in each photograph, for example:
 - 1.9.4.1.4.1. DSC_010 to DSC_016 – Impression A
 - DSC_017 to DSC_018 – Impression B
 - DSC_019 – Impressions A&B
 - 1.9.4.1.5. Each latent print suitable for comparison shall be labeled. This can be done in Mideo Workspace or Adobe ® Photoshop®; it need not be on printed photographs.
 - 1.9.4.1.6. Digital photographs do not need to be marked for identification.
 - 1.9.4.2. Printed Photographs
 - 1.9.4.2.1. Each photograph shall be marked for identification with the analyst's initials, case number, and laboratory item number.
 - 1.9.4.2.2. If there are multiple photographs of the same latent print, each photograph may be given a unique identifier to be able to document which latent prints are in each photograph. This may be done by numbering the photographs and documenting in the case notes which numbers contained which latent prints.
 - 1.9.4.2.3. Each latent print suitable for comparison shall be labeled.
 - 1.9.4.3. In the analysis of each photograph, the analyst shall document if there are focus issues, if there is a scale present, and if there are any issues with the scale.
 - 1.9.4.4. The analyst shall upload all photographs used for analysis purposes into the Submitted Photographs folder in Mideo Caseworks, with the exception of duplicate photographs that will be preserved in the Non-Casework folder.
 - 1.9.4.4.1. If a photograph contains multiple latent prints, each latent print shall be labeled.

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- 1.9.4.5. The analyst shall upload each photograph of a latent print of value into the Latents folder in Mideo Caseworks.
 - 1.9.4.5.1. If there are duplicate photographs of the same latent print, the best quality image shall be selected and uploaded into the Latents folder in Mideo Caseworks.
- 1.9.4.6. General Crime Scene Photographs
 - 1.9.4.6.1. If general crime scene photographs are included, this shall be documented with an indication of how many photographs are of general crime scene.
 - 1.9.4.6.1.1. If the analyst chooses to retain general crime scene photographs, they shall be uploaded into the Non-Casework Images folder in Mideo Caseworks.
- 1.9.5. Documentation of Exemplars Used for Comparison
 - 1.9.5.1. Each page of submitted exemplars shall be marked for identification with the analyst's initials, case number, and laboratory item number. Each page of exemplars should be marked for identification prior to scanning for documentation purposes.
 - 1.9.5.2. Exemplars used for comparison shall be scanned from 500-1000 ppi and uploaded into the Comparison Exemplars folder in Mideo Caseworks for comparison purposes. There may be instances where exemplars with multiple pages would be uploaded in the Additional Documentation folder in Mideo Caseworks (see [Appendix 1](#)).
 - 1.9.5.3. The front and back of exemplars may be scanned in PDF format and uploaded into the Additional Documentation folder in Mideo Caseworks.
 - 1.9.5.3.1. The PDF formatted exemplar should not be used as the primary source for comparisons. A TIFF format image will yield a higher resolution exemplar.
 - 1.9.5.3.2. If the exemplar is in PDF file format, it shall be uploaded into LIMS-Plus JusticeTrax.
 - 1.9.5.4. If an identification is made, the area of the finger or palm that was identified shall be plotted and charted along with the latent print, and this chart shall be uploaded into the Additional Documentation folder in Mideo Caseworks.
 - 1.9.5.5. Any exemplars that need digital enhancement for comparison shall be uploaded into the Comparison Exemplars folder in Mideo Caseworks prior to enhancement so that the enhancement is recorded in Mideo Caseworks.
 - 1.9.5.6. If the exemplars are going to be used for a comparison, an analysis of the exemplars describing the clarity of the impressions shall be documented in the case notes.
 - 1.9.5.7. If exemplars are not suitable for comparison, this shall be documented in the case notes and exemplars of higher quality shall be requested in the analyst's report.

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- 1.9.5.8. If an exemplar is requested from the Indiana State Police Records Division, a copy of the email shall be uploaded into LIMS-Plus JusticeTrax. The digital copy of the exemplar shall be uploaded into the Comparison Exemplars folder in Mideo Caseworks for documentation purposes.
- 1.9.6. Documentation of Post-Mortem Prints**
 - 1.9.6.1. Post-mortem impressions that are compared to a submitted exemplar only need documentation of comparison of one finger from each hand for the purposes of an identification or exclusion, when possible.
 - 1.9.6.2. Post-mortem impressions from one individual that are submitted to be entered into AFIS do not need all fingers entered into AFIS, but rather the best quality impression from each hand shall be entered.
- 1.9.7. Documentation of Item Processing/Actions Taken**
 - 1.9.7.1. If an item has multiple examination requests and the item is examined in the presence of another analyst, this shall be documented in the case notes.
 - 1.9.7.1.1. Document the name of the analyst and any actions taken by that analyst.
 - 1.9.7.1.1.1. Example: Item X was opened in the presence of Serologist, John Doe. He swabbed the textured rubber grip area on Item X.
 - 1.9.7.2. If a sub-item or a new item is created from an item in your custody, this shall be documented in the case notes.
 - 1.9.7.2.1. Document the date the sub-item or new item was created and what the sub-item or new item contains.
 - 1.9.7.2.1.1. Note: The sub-item or new item shall be created in LIMS-Plus JusticeTrax before returning the parent item to Laboratory's evidence storage.
 - 1.9.7.3. When feasible, paper items should be preserved prior to processing. The TIFF or PDF digital scans of the images shall be uploaded to the Additional Documentation folder in Mideo Caseworks.
 - 1.9.7.4. All processing techniques utilized shall be documented in the case notes. Prior to the use of any chemical, a reagent check shall be performed and documented in the case notes.
 - 1.9.7.4.1. If a processing technique is not utilized or if there is a deviation from the suggested processing, an explanation shall be documented in the case notes.
 - 1.9.7.5. If there are multiple Cyanoacrylate Fuming Cabinets in a regional laboratory, the analyst shall document which Cyanoacrylate Fuming Cabinet was utilized throughout the case.
 - 1.9.7.6. Equipment used in the visualization of a latent print (e.g. ALS, Laser, RUVIS) shall be documented in the case notes.
 - 1.9.7.7. Once all processing is completed, each item shall be marked for identification with the analyst's initials, case number, and

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laboratory item number. If an item cannot be marked for identification, this shall be documented with a reason why in the case notes.

- 1.9.7.8. Mikrosil casts and gel-lifts shall be flipped prior to comparison as they are reverse/mirror images of the actual latent print. All images that are flipped shall be labeled as such, and shall be documented in the case notes.

- 1.9.7.8.1. It is not uncommon to see flipped latent prints on tape cases. Possibility of this occurrence shall be considered during comparison and shall be documented in the case notes.

1.9.8. Documentation of Latent Prints Observed/Developed

- 1.9.8.1. Each item(s) shall be visually examined prior to any processing. If any latent prints of value are observed, they shall be documented in the case notes and photographed.

- 1.9.8.1.1. If a latent print is observed/developed, the location of the latent print on the item shall be documented either by a written description or a digital image, which shall be uploaded into the Location folder in Mideo Caseworks.

- 1.9.8.2. After each processing step, the item(s) shall be examined to determine if any additional latent prints of value were developed.

- 1.9.8.2.1. If no friction ridge detail was observed/developed, this shall be documented in the case notes.

- 1.9.8.2.2. If friction ridge detail was observed/developed, but there was insufficient detail for comparison, this shall be documented in the case notes. However, these impressions need not be photographed.

- 1.9.8.2.3. If friction ridge detail was observed/developed that may be suitable for comparison, this detail shall be photographed.

- 1.9.8.2.3.1. The photographs used for comparison purposes shall be uploaded in the Latents folder in Mideo Caseworks as part of the case notes.

- 1.9.8.2.4. If a latent print is observed/developed after multiple steps, it need not be photographed each time if the contrast is not improved; however, if an observed/developed latent print is photographed, at least one photograph from each step shall be uploaded into the Latents folder in Mideo Caseworks.

- 1.9.8.2.4.1. If a better quality photograph of the same latent print is used for comparison, indicate within Mideo Caseworks that latent print is a duplicate and that another photograph of the same latent print was used for comparison purposes.

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- 1.9.8.3. If lifts are created by the analyst during examination and the lifts are:
 - 1.9.8.3.1. Not suitable for comparison, they can be discarded.
 - 1.9.8.3.2. Suitable for comparison and the best quality image, they shall be made an item of evidence in the Evidence Folder and scanned into the Lifts folder in Mideo Caseworks for preservation.
 - 1.9.8.3.2.1. They shall be made into a new item in LIMS and will be returned to the contributor (see Laboratory Policy EVID-025).
- 1.9.9. Documentation of Analysis
 - 1.9.9.1. Analysis documentation shall include all the information the analyst uses to make their determination of suitability for comparison.
 - 1.9.9.1.1. Note: Ten-print and CODIS identifications do not need analysis documentation.
 - 1.9.9.2. Latent Prints of No Value for Comparison
 - 1.9.9.2.1. Any latent print that is not suitable for comparison does not need to be plotted.
 - 1.9.9.2.2. It may be noted as to why the latent print was determined to be of no value. Example: fragmented, smudges, little detail / minutiae present.
 - 1.9.9.3. Latent Prints that are deemed Suitable for Comparison
 - 1.9.9.3.1. Any latent print that will be compared for identification purposes shall be plotted and saved in the Latents folder in Mideo Caseworks.
 - 1.9.9.3.1.1. Examples of plotting include, but are not limited to: using dots, using the paint feature, circling an area to show an “event” occurring, or using a color coding system (for example: green, yellow, red, and orange system [GYRO]) or legend. This is the analyst’s preference.
 - 1.9.9.3.1.1.1. GYRO is a color coding system that represents varying level of certainty of friction ridge details through the use of specified colors when charting.
 - 1.9.9.3.1.1.1.1. (G)reen – used to note friction ridge details observed with high confidence levels.
 - 1.9.9.3.1.1.1.2. (Y)ellow – used to note friction ridge details observed with medium condience levels.
 - 1.9.9.3.1.1.1.3. (R)ed – used to note friction ridge details observe with a great deal of uncertainty.

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- 1.9.9.3.1.1.1.4. (O)range – used to note friction ridge details not initially observed when analyzing the latent print, but observed in the latent print after noticing the friction ridge details in the exemplar impression.
- 1.9.9.3.1.2. Latent prints deemed “high quality/quantity” will need minimal plotting.
- 1.9.9.3.1.3. Sufficient detail shall be plotted to make an identification; however, not all level 2 or level 3 details need to be plotted.
- 1.9.9.3.2. There shall also be a written description of level 1, 2, and 3 details, as well as any other information deemed useful by the analyst.
 - 1.9.9.3.2.1. Analysts should reference the following for their written descriptions:
 - 1.9.9.3.2.1.1. High Quality
 - 1.9.9.3.2.1.1.1. Level 1 is distinct.
 - 1.9.9.3.2.1.1.2. Level 2 details are distinct.
 - 1.9.9.3.2.1.1.3. There are abundant distinct Level 3 details.
 - 1.9.9.3.2.1.2. Medium High Quality
 - 1.9.9.3.2.1.2.1. Level 1 is distinct.
 - 1.9.9.3.2.1.2.2. Most of the Level 2 details are distinct.
 - 1.9.9.3.2.1.2.3. There are minimal distinct Level 3 details.
 - 1.9.9.3.2.1.3. Medium Low Quality
 - 1.9.9.3.2.1.3.1. Level 1 is distinct.
 - 1.9.9.3.2.1.3.2. Few of the Level 2 details are distinct.
 - 1.9.9.3.2.1.3.3. There are minimal distinct Level 3 details.
 - 1.9.9.3.2.1.4. Low Quality
 - 1.9.9.3.2.1.4.1. Level 1 may not be distinct.
 - 1.9.9.3.2.1.4.2. Most of the Level 2 details are indistinct.
 - 1.9.9.3.2.1.4.3. There are no distinct Level 3 details.
 - 1.9.9.3.2.2. Written description shall include any distortion, pressure, movement, background interference, clarity issues, or red flags in the latent.
 - 1.9.9.3.2.3. If there is an indication of simultaneous impressions, it may be documented.

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- 1.9.9.3.2.3.1. To identify simultaneous impressions, each impression must be able to be identified on its own.
- 1.9.9.3.2.3.2. If the impression contains conjoining areas from a palm and fingers, the impression can be considered one impression as opposed to individual impressions.
- 1.9.9.3.2.4. Example written description for high quality/quantity:
 - 1.9.9.3.2.4.1. L1 – appears to be an arch, possible tip of finger
 - 1.9.9.3.2.4.2. L2 – abundance of minutiae
 - 1.9.9.3.2.4.3. L3 – abundance of pores visible, distinct angles and shapes of edges visible
 - 1.9.9.3.2.4.4. No distortion noted
- 1.9.9.3.2.5. Example written description for low quality/quantity:
 - 1.9.9.3.2.5.1. L1 – straight ridges, appears to be an extreme side of a finger
 - 1.9.9.3.2.5.2. L2 – distinct minutiae visible – see plotted latent print
 - 1.9.9.3.2.5.3. L3 – limited number of pores and lack of distinct angles, shapes, and edges visible
 - 1.9.9.3.2.5.4. Some distortion due to pressure and movement, ridges appear elongated
- 1.9.9.3.3. If a latent print is deemed suitable for comparison, the analyst shall document if the print is suitable for AFIS/IAFIS entry.
 - 1.9.9.3.3.1. If the latent print is not suitable for AFIS/IAFIS entry, the analyst shall document the reason in the case notes.
- 1.9.10. Documentation of Comparison**
 - 1.9.10.1. Consultations of latent print comparisons shall be documented in the case notes.
 - 1.9.10.1.1. Note: If an analyst has consulted on a particular latent print, then the assisting analyst shall not do the verification of that impression.
- 1.9.11. Documentation of Evaluation**
 - 1.9.11.1. Inconclusive Results
 - 1.9.11.1.1. The analyst shall document in their case notes why the latent print was not identified.
 - 1.9.11.1.2. Inconclusive results can be due to the low quality of the latent print, due to the exemplars not clearly depicting the area of the latent print, or due to

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insufficient agreement and disagreement of individualizing characteristics.

- 1.9.11.1.3. If there are significant similarities noted but there is insufficient information in agreement for identification, this shall be documented in the case notes. A chart of the plotted latent next to the plotted known print shall be made, and this chart shall be labeled and uploaded into the Additional Documentation folder in Mideo Caseworks for documentation.

1.9.11.2. Identification Results

- 1.9.11.2.1. If an identification is made, a chart of the plotted latent print next to the plotted known print shall be made. This chart shall be labeled uploaded into the Additional Documentation folder in Mideo Caseworks for documentation.

- 1.9.11.2.2. If there is insufficient level 2 detail present for identification, then level 3 detail shall be plotted. If there is sufficient level 2 detail for an identification, then level 3 detail does not need to be plotted.

- 1.9.11.2.3. If there are significant changes from the original plot in the analysis of the latent print to the plot of the latent print next to the known print, these changes shall be documented in the case notes.

- 1.9.11.2.3.1. Note: Changing a bifurcation to a ridge ending and vice versa is not a significant change.

- 1.9.11.2.4. Identification of a ten print card to another ten print card or in the case of post mortem prints to an exemplar shall only require an identification of one finger per hand, when possible.

1.9.11.3. Exclusion Results

- 1.9.11.3.1. Exclusions do not need to be plotted.

- 1.9.11.3.2. Note: Difficult or close non-match exclusions which were plotted during the comparison process should be labeled and uploaded into the Additional Documentation folder in Mideo Caseworks.

- 1.9.11.3.3. Exclusion of a ten print card to another ten print card or in the case of post mortem prints to an exemplar shall only require an exclusion of one finger per hand, when possible.

1.9.12. Documentation of Verification

- 1.9.12.1. When an identification or exclusion is made, the name of the verifier shall be documented in the Verification folder in Mideo Caseworks.

- 1.9.12.1.1. The analyst shall keep record of CODIS verifications using a verification log (see [Appendix 7](#)).

- 1.9.12.2. A technical variation and/or conflict of opinion between the initial analyst and the verifier shall be documented in the case notes.

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1.9.12.2.1. The resolution process of a technical variation or conflict of opinion shall be documented in the case notes. In addition, all plottings from the initial analyst, the verifier, and any other individual(s) involved in the resolution shall be uploaded in the Additional Documentation folder in Mideo Caseworks.

1.9.13. Documentation of AFIS/IAFIS Entries

- 1.9.13.1. If a latent print is entered into the AFIS and IAFIS databases and the latent print is not registered, this shall be documented in the case notes.
- 1.9.13.2. When a latent print is searched in the AFIS database, it is given a key number. The key number consists of the laboratory case number and a number assigned by the analyst to that latent print. This key number shall be documented in the case notes.
- 1.9.13.3. When a latent print is searched in the IAFIS database, it is given a key number. The key number may consist of the analyst's PE number or initials, the laboratory case number, and a number assigned by the analyst to that latent print. This key number shall be documented in the case notes.
- 1.9.13.4. Once a latent print is searched in the AFIS and IAFIS databases, it shall be logged into the AFIS log (see [Appendix 7](#)). This log shall contain:
 - 1.9.13.4.1. the laboratory case number
 - 1.9.13.4.2. the latent print identifier
 - 1.9.13.4.3. the date the latent was searched
 - 1.9.13.4.4. the AFIS key number
 - 1.9.13.4.5. the analysts initials and PE number
 - 1.9.13.4.6. whether or not the latent print hit in AFIS or IAFIS or if the latent print didn't generate a hit

1.9.14. Miscellaneous Documentation

- 1.9.14.1. Communication with a member of a Criminal Justice Agency
 - 1.9.14.1.1. If an officer or investigator is contacted regarding the examination of the case, it shall be documented in the case notes.
 - 1.9.14.1.1.1. If the information discussed affects another unit, it shall also be documented in LIMS-Plus JusticeTrax in the dissemination report.
 - 1.9.14.1.2. If case information (such as a case report or the case notes) is being released to another Criminal Justice agency, this shall be documented in LIMS-Plus JusticeTrax in the dissemination report.
- 1.9.14.2. Laboratory Policy
 - 1.9.14.2.1. If evidence is in an analyst's custody for more than 45 days, a Unit Supervisor shall be notified and the reason why it has been in the analyst's custody over 45 days shall be documented in the case notes (Laboratory Policy EVID-001).

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1.9.14.2.2. If evidence is left in another analyst's custody temporarily, this shall be documented in the case notes (Laboratory Policy EVID-001).

1.9.15. Preservation of Case Notes

- 1.9.15.1. When striking out a letter or number on a handwritten case record, a single line is to be drawn through the correction and initialed (Indiana State Police Laboratory Quality Assurance Manual); or if the change is made electronically, then version 2 of the document shall be uploaded into LIMS-Plus JusticeTrax.
 - 1.9.15.2. The laboratory case number and original handwritten analyst's initials or secure electronic equivalent shall be on each page of examination documentation. When both sides of a page are used, each side shall be treated as a separate page (Indiana State Police Laboratory Quality Assurance Manual).
 - 1.9.15.3. Any handwritten notes shall be kept as part of the case documentation. The originals shall be scanned and uploaded into LIMS-Plus JusticeTrax. The original can be destroyed after verifying that it was successfully uploaded.
 - 1.9.15.4. All printed pages and hard copies of notes shall have a digital equivalent. Digital notes shall be uploaded into LIMS-Plus JusticeTrax.
 - 1.9.15.5. Naming of files that are uploaded into LIMS-Plus JusticeTrax shall follow Laboratory Policy GEN-037.
 - 1.9.15.5.1. Lifts, exemplars, notes, worksheets, Laboratory Submission Forms, etc. shall all be uploaded with appropriate file names. Examples of file names include:
 - LP_10I1234_R1_629_7477_S1
 - LP_10I1234_R1_FINAL NOTES_7477_V1
 - LP_10I1234_R1_I002_5LIFTS_7477_S1
 - LP_10I1234_R1_I003_10PRINT J SMITH_7477_S1
 - LP_10I1234_R1_I005 GUN_7477_P1
 - 1.9.15.6. All digital imaging documentation shall be stored in Mideo Caseworks and shall be backed up to an additional storage device, such as a CD or a server. No digital images will be required to be printed for inclusion in the case notes. Printing the images or making contact sheets shall be left up to the analyst's preference; however, printed images may be needed for court.
- 1.9.16. Additional Data Section in LIMS-Plus JusticeTrax may be completed as follows:**
- 1.9.16.1. How to calculate or fill in each field in the Additional Data Section
 - 1.9.16.1.1. # of Items:
 - 1.9.16.1.1.1. Count every item you examined.
 - 1.9.16.1.1.2. Example 1: A firearm, magazine, and six cartridges are counted as eight items.

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- 1.9.16.1.1.3. Example 2: A CD containing six photographs is counted as six items.
- 1.9.16.1.2. # of Photos:
 - 1.9.16.1.2.1. This is the number of images with impressions that were photographed and then uploaded into Mideo Caseworks. Do not count any JPEG or overall item photographs, or photos that were submitted by the contributor or scans of lift cards.
 - 1.9.16.1.2.1.1. Note: Photos from the contributor should be counted in # of Items.
- 1.9.16.1.3. # of LOV (latent of value) Developed:
 - 1.9.16.1.3.1. Each latent print you consider suitable for comparison is a Latent of Value (LOV).
 - 1.9.16.1.3.2. Do not count the same latent print several times if you have photographed it with several processing techniques or if it appears in multiple submitted photographs.
- 1.9.16.1.4. # of Comparisons
 - 1.9.16.1.4.1. In AFIS, the number of candidates requested is the number of comparisons.
 - 1.9.16.1.4.2. Each ten-print card counts as 10 comparisons.
 - 1.9.16.1.4.3. A set of major case prints counts as 20 comparisons.
- 1.9.16.1.5. # of Palm Prints
 - 1.9.16.1.5.1. The number of LOV that are palm prints.
- 1.9.16.1.6. # AFIS Entered
 - 1.9.16.1.6.1. The number of latent prints searched in AFIS.
- 1.9.16.1.7. # IAFIS Entered
 - 1.9.16.1.7.1. The number of latent prints searched in IAFIS.
- 1.9.16.1.8. # Id's
 - 1.9.16.1.8.1. The number of identifications made.
- 1.9.16.1.9. # Elim's
 - 1.9.16.1.9.1. The number of exclusions made.
 - 1.9.16.1.9.1.1. Note: If you exclude one print from one person this counts as one exclusion (not 10 because there were ten prints on the print card).
- 1.9.16.1.10. Other
 - 1.9.16.1.10.1. List any other process you did that is not listed.
- 1.9.16.1.11. Development Processes
 - 1.9.16.1.11.1. Fill in the number of pieces of evidence that you used that process on.
 - 1.9.16.1.11.1.1. Example: For 6 cartridges and a firearm processed with Cyanoacrylate fuming, you would

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put a number 7 in front of CA
Fuming.

- 1.10. Interpretations of Results:** Results are based on the quality and quantity of the friction ridge detail and are reproducible by another qualified analyst. Results are determined during the evaluation phase after the analyst has conducted an analysis and comparison of friction ridge impressions. Conclusions that may be reached are Identification (Individualization), Exclusion, or Inconclusive.
- 1.10.1.** Identification (Individualization) is reached when both the unknown and known impressions are in agreement and contain sufficient friction ridge detail in sequence having detectable uniqueness so that the likelihood the impression was made by another source is so remote that it is considered as a practical impossibility.
 - 1.10.2.** Exclusion is reached when the unknown and known impressions being compared are in disagreement or contain a difference in characteristics or features.
 - 1.10.3.** Inconclusive findings result from the absence of sufficient friction ridge detail (lack of quality or quantity) to effect a conclusion of identification or exclusion. Inconclusive findings may also be attributed to the absence of a comparable area in the known exemplar. Inconclusive findings are often reported as “no identification or exclusion was made,” and is followed by a reason why the result is inconclusive.
- 1.11. Report Writing:** The following shall be addressed within the body of the report. The exact wording of the results is left to the analyst’s discretion; however, some example report wording guidelines are listed in the next section.
- 1.11.1.** Information to be addressed in the Report
 - 1.11.1.1.** The number of latent prints suitable for comparison shall be addressed for each item.
 - 1.11.1.1.1.** Note: Differentiate between prints that were merely observed and those that were developed.
 - 1.11.1.2.** Each item within the evidence packaging shall be inventoried on the report. If an item contains multiple components, each component shall be described and its examination or lack of examination shall be addressed on the report. So, if an item contains a firearm, a magazine, and three cartridges, the conclusions shall state on what the print was developed. For example: “Two latent prints were developed on the magazine. No latent prints suitable for comparison were developed on the firearm or the three cartridges.”
 - 1.11.1.2.1.** If an item contains only lifts, the lifts may be addressed as one component on the report (i.e. one latent print of value was observed on the lift cards from Item 001).
 - 1.11.1.2.2.** If an item or a component of an item is not examined, this shall be stated with a reason why it was not examined.

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- 1.11.1.3. If a latent print is identified, excluded, or entered into AFIS, it must have a unique label where it can be clearly identified within the report. If there is only one latent print or all latent prints have the same result, then no unique labels are necessary in the report.
- 1.11.1.4. If an identification is made on a lift, then the agency's label/description for location of lift, if available, should be included in the report.
- 1.11.1.5. If a comparison to an exemplar(s) is conducted, this shall be stated, as well as the results of that comparison.
- 1.11.1.6. The reason for an inconclusive result shall be stated.
- 1.11.1.7. If a latent print is searched in AFIS and/or IAFIS, this shall be stated.
 - 1.11.1.7.1. If the IAFIS search is restricted by states, this shall be stated specifying the states.
 - 1.11.1.7.1.1. If an identification is made as a result of an IAFIS search and there are no other unidentified latent prints that have been searched in IAFIS, then the state restriction does not need to be reported.
- 1.11.1.8. If evidence was retained by the Laboratory, this shall be stated.
- 1.11.1.9. If additional evidence (which could include but is not limited to hairs, fibers, and/or glass) is collected from the parent item by an analyst for a potential future examination and returned in the original packaging, this shall be stated in the report.
- 1.11.1.10. If an analyst creates a sub-item or a new item that will be returned directly to the contributor without further examinations, this shall be stated in the report.
- 1.11.1.11. Supplemental reports generally do not contain the results from the original certificate of analysis, and should only address the results for the item(s) of evidence or latent prints that were needed for the additional examination.
- 1.11.1.12. Laboratory results shall be reported accurately, clearly, unambiguously, and objectively. A table with all the pertinent case information may be used to clearly state the results.
- 1.11.2. Examples: The following are some basic report wording guidelines. There may be situations that do not fit the examples given. Unique wording for these situations shall be developed as the need arises.
 - 1.11.2.1. When using the table option for latent print cases with no latent prints of value, the following boilerplate wording is suggested (LIMS-Plus JusticeTrax auto text "nov F3"):
 - 1.11.2.1.1. The non-exemplar items listed above were examined for the presence of latent prints. No latent prints suitable for comparison purposes were developed or observed; therefore, no comparisons could be performed.

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- 1.11.2.2. When using the table option for latent print cases when comparisons are required, the following boilerplate wording is suggested (LIMS-Plus JusticeTrax auto text "lp F3"):

1.11.2.2.1. All non-exemplar items listed above were examined for the presence of latent prints. All latent prints suitable for comparison purposes were preserved by digital imaging.

The latent prints suitable for comparison purposes were compared to any submitted exemplars listed above, any exemplars obtained from the Indiana State Police Archive, and any exemplars obtained as a result of searches in the Indiana State Police Automated Fingerprint Identification System (AFIS) and the Integrated Automated Fingerprint Identification System (IAFIS).

Any unidentified latent print of suitable quality was entered into AFIS and IAFIS. If a latent print was entered into AFIS and IAFIS with no identification made, you will be notified if an identification is made in the future.

Conclusions are based upon the friction ridge skin depicted in the exemplars; the names on the exemplars are reported below. An inconclusive result is the determination by an examiner that there is neither sufficient agreement to identify, nor sufficient disagreement to exclude. In the event of an inconclusive result, clear and complete major case prints should be submitted for further comparison, unless otherwise noted. Please contact the reporting analyst with any questions regarding this case.

- 1.11.2.3. When using the table option for latent print cases which include a tenprint to latent inquiry (TLI hit), the following boilerplate wording is suggested (LIMS-Plus JusticeTrax auto text "tli F3"):

1.11.2.3.1. All non-exemplar items listed above were previously examined for the presence of latent prints. All latent prints suitable for comparison purposes were preserved by digital imaging.

As the result of a previous entry in the Indiana State Police Automated Fingerprint Identification System (AFIS) or the Integrated Automated Fingerprint Identification System (IAFIS), the unidentified latent prints suitable for comparison purposes were compared to exemplars obtained from the Indiana State Police Archive or the IAFIS database.

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Conclusions are based upon the friction ridge skin depicted in the exemplars; the names on the exemplars are reported below. An inconclusive result is the determination by an examiner that there is neither sufficient agreement to identify, nor sufficient disagreement to exclude. In the event of an inconclusive result, clear and complete major case prints should be submitted for further comparison, unless otherwise noted. Please contact the reporting analyst with any questions regarding this case.

- 1.11.2.4. When using the table option for latent print cases which are a supplemental report, the following boilerplate wording is suggested (LIMS-Plus JusticeTrax auto text "sup F3"):

1.11.2.4.1. All non-exemplar items listed above were previously examined for the presence of latent prints. All latent prints suitable for comparison purposes were preserved by digital imaging.

The unidentified latent prints suitable for comparison purposes were compared to additional submitted exemplars listed above and any additional exemplars obtained from the Indiana State Police Archive.

Conclusions are based upon the friction ridge skin depicted in the exemplars; the names on the exemplars are reported below. An inconclusive result is the determination by an examiner that there is neither sufficient agreement to identify, nor sufficient disagreement to exclude. In the event of an inconclusive result, clear and complete major case prints should be submitted for further comparison, unless otherwise noted. Please contact the reporting analyst with any questions regarding this case.

- 1.11.2.5. When using the table option for latent print cases which are considered post mortem and require comparisons, the following boilerplate wording is suggested (LIMS-Plus JusticeTrax auto text "pm F3"):

1.11.2.5.1. All post-mortem items listed above were examined for the presence of impressions or areas suitable for obtaining impressions. All impressions suitable for comparison purposes were preserved by digital imaging.

The post-mortem impressions suitable for comparison purposes were compared to any submitted exemplars listed above, any exemplars obtained from the Indiana State Police Archive, and any exemplars obtained as a result of searches in

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the Indiana State Police Automated Fingerprint Identification System (AFIS) and the Integrated Automated Fingerprint Identification System (IAFIS).

Any unidentified impressions of suitable quality were entered into AFIS and IAFIS. If impressions were entered into AFIS and IAFIS with no identification made, you will be notified if an identification is made in the future.

Conclusions are based upon the friction ridge skin depicted in the exemplars; the names on the exemplars are reported below. An inconclusive result is the determination by an examiner that there is neither sufficient agreement to identify, nor sufficient disagreement to exclude. In the event of an inconclusive result, clear and complete major case prints should be submitted for further comparison, unless otherwise noted. Please contact the reporting analyst with any questions regarding this case.

1.11.2.6. When not using the table option, the following is suggested report wording:

1.11.2.6.1. Use for Comparison

1.11.2.6.1.1. The _____ (Number) latent prints were compared to the copy of the livescan fingerprint card bearing the name _____ (name as it appears on card).

1.11.2.6.1.2. _____ (Number) latent prints were compared to the fingerprint card bearing the name _____ (name as it appears on card).

1.11.2.6.1.3. The latent prints were compared to the fingerprint cards bearing the name(s) _____ (name(s) as it appears on card). The exemplars were obtained through the Indiana State Police Archive.

1.11.2.6.2. Deferred/Limited Comparisons

1.11.2.6.2.1. One of the latent prints from item _____ was identified as having been made by the same person who made the impressions on the fingerprint card bearing the name _____ (name as it appears on the card). The remaining latent prints from item _____ were not compared or entered into the Indiana State Police's Automated Fingerprint Identification System (AFIS) due to this identification. If further examination is requested, please contact the reporting analyst.

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1.11.2.6.3. Use for No Ten-Print Card on File

1.11.2.6.3.1. Known exemplars for _____ (name) were unable to be obtained, as the ten-print card was not on file at the Indiana State Police Archive.

1.11.2.6.4. Use for Items that were not processed

1.11.2.6.4.1. The _____ inside the _____ (Item #) was not processed at this time. Please contact the reporting analyst if additional processing is needed.

1.11.2.6.5. Use for Items that were withdrawn

1.11.2.6.5.1. The request for latent print examination of Item _____ (Item #) was withdrawn by _____ (officer name), _____ (agency name), on _____ (date withdrawn).

1.11.2.6.6. Use for Retained Evidence

1.11.2.6.6.1. _____ will be retained by the Indiana State Police Laboratory for the possibility of future analysis.

1.12. References:

- 1.12.1. 2006 ASCLD/LAB-*International Supplemental Requirements*
- 1.12.2. BVDA America Inc. "Acid Yellow 7." 22 July 2009
http://usa.bvda.com/productinfo.php?file=acid_yellow_7
- 1.12.3. CBDIAI. "Latent Fingerprint Processing Techniques-Selection & Sequencing Guide." 18 June 2010 <http://www.cbdi.ai.org/Reagents/main.html>
- 1.12.4. Coleman Vacu-Print™ Manual by Lightning Powder® Company, Inc.
- 1.12.5. CrimeScope® CS-16 Tunable Forensic Light Source Manual by SPEX Forensics
- 1.12.6. Deep Vacuum Pumps Manual by Fast Vac
- 1.12.7. Federal Bureau of Investigation. U.S. Dept. of Justice. *Processing Guide for Developing Latent Prints*. U.S. Government, 2000.
- 1.12.8. Hot Plate Manual by Barnstead International
- 1.12.9. ISO/IEC 17025:2005, ASCLD/LAB-International (American Society of Crime Laboratory Directors/Laboratory Accreditation Board)
- 1.12.10. Michele Triplet's Fingerprint Terms. 23 June 2010
<http://www.nwlean.net/fprints/index.htm>
- 1.12.11. Mideo Systems Inc, *Indiana State Police Reference Material*
- 1.12.12. Model 6105 Fingerprint Development Chamber Operations Manual by Caron
- 1.12.13. Nikon® Camera Manual(s) by Nikon
- 1.12.14. Reflected Ultra-Violet Imaging System (RUVIS) Manual by Horiba Jobin Yvon
- 1.12.15. SafeAire Fume Hood Manual by Fisher Hamilton
- 1.12.16. SafeFume Cyanoacrylate Automated Fuming Cabinet Manual by Air Science® USA
- 1.12.17. Safety Manual, Indiana State Police Laboratory
- 1.12.18. Stirrers, Hotplates, and Stirring Hotplates Manual by Fisher Scientific

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- 1.12.19.** SWGFAST Documents (Scientific Working Group on Friction Ridge Analysis, Study and Technology)
<http://www.swgfast.org/CurrentDocuments.html>
- 1.12.20.** TracER Laser Manual by Coherent®
- 1.12.21.** Ultraviolet Crosslinkers Manual by Ultra-Violet Products Ltd.

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2. Footwear and Tire Track Comparison Method:

2.1. Scope: This method defines the procedures and techniques that are routinely used in the examination of evidence for footwear and tire track impressions. Footwear and Tire Track Impression examinations are conducted using the Analysis, Comparison, Evaluation, and Verification (ACE-V) Methodology, utilizing both qualitative and quantitative analysis. Other comparative impression examinations, including but not limited to fabric examinations, may be conducted using these defined procedures and techniques upon administrative approval.

2.2. Precautions/Limitations: Not all footwear and tire track impressions are able to be identified. There are many factors that affect whether an impression is suitable for identification and/or exclusion. These include:

2.2.1. The Presence of Identifying Characteristics: Identifying characteristics occur as a result of something that is randomly added or removed from the tread, usually through the wearing of the tread. Therefore, shoes or tires which are not worn nor have very little wear are unlikely to have identifying characteristics and will only be able to be associated through class characteristics. Class characteristics are those characteristics which are created during the manufacturing process and are shared by one or more other shoes or tires.

2.2.2. Matrix: The matrix (substance) on the tread varies along with the amount of matrix on the tread. Too much or not enough matrix can result in a low quality and/or quantity impression.

2.2.3. Pressure: The amount of pressure applied to an object (deposition pressure) when the impression is made can cause distortion of the impression, which can result in poor quality impressions. In addition, if there is pressure from the side (lateral pressure), the result can be smearing or smudging of the impression.

2.2.4. Substrate: The substrate (surface) that the footwear or tire is coming into contact with affects the quality and type (2-dimensional or 3-dimensional) of impression.

2.2.5. Environment: If the object is subjected to various environmental conditions (e.g. rain, snow, wind, etc.) after or during the deposition of impressions, the impressions may be destroyed.

2.2.6. Collection of the Impression: High quality photographs, along with lifting and casting of the impression, are needed for the best results.

2.3. Related Information:

2.3.1. [Latent Print Test Method 3: Digital Image Processing Method](#)

2.3.2. [Appendix 1 Mideo Caseworks/Workspace Documentation](#)

2.3.3. [Appendix 2 Technical and Administration Review Procedure for Latent Print Cases](#)

2.3.4. [Appendix 3 Technical and Administrative Review Procedure for Footwear and Tire Cases](#)

2.3.5. [Appendix 4 Example Worksheets](#)

2.3.6. [Appendix 5 Abbreviations](#)

2.3.7. [Appendix 6 ALS Filter and Goggle Recommendations](#)

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- 2.3.8. [Appendix 7 Logs](#)
- 2.3.9. [Appendix 8 Processing Manual](#)
- 2.3.10. [Appendix 9 Instrumentation Calibration and Maintenance](#)
- 2.4. **Instruments:**
 - 2.4.1. [Alternate Light Source \(ALS\)](#)
 - 2.4.2. [Balances](#)
 - 2.4.3. [Cyanoacrylate Fuming Cabinet](#)
 - 2.4.4. [Chemical Exhaust Hoods](#)
 - 2.4.5. [Digital Cameras](#)
 - 2.4.6. [Heat/Humidity Chamber](#)
 - 2.4.7. [Laser](#)
 - 2.4.8. [Reflective Ultra-Violet Imaging System \(RUVIS\)](#)
 - 2.4.9. [Scales/Rulers](#)
 - 2.4.10. [Shoeprint Image Capture and Retrieval \(SICAR\)](#)/Tread Assistant
 - 2.4.11. [Table-top Exhaust Hoods](#)
 - 2.4.12. [Ultra-violet \(UV\) Crosslinker](#)
- 2.5. **Reagents/Materials:**
 - 2.5.1. Light Based Methods
 - 2.5.1.1. [Alternate Light Source \(ALS\)](#)
 - 2.5.1.2. [Reflective Ultra-violet Imaging System \(RUVIS\)](#)
 - 2.5.1.3. [TracER Laser](#)
 - 2.5.2. Physical Based Methods
 - 2.5.2.1. [Fingerprint Powders](#)
 - 2.5.2.2. [Small Particle Reagent \(SPR\)](#)
 - 2.5.2.3. [Sticky Side Powder](#)
 - 2.5.3. Chemical Based Methods
 - 2.5.3.1. [Acid Yellow 7](#)
 - 2.5.3.2. [Amido Black](#)
 - 2.5.3.3. [Ardrox](#)
 - 2.5.3.4. [Chemical Fuming](#)
 - 2.5.3.5. [Coomassie Brilliant Blue](#)
 - 2.5.3.6. [Cyanoacrylate Fuming](#)
 - 2.5.3.7. [1, 8-Diazafluoren-9-one \(DFO\)](#)
 - 2.5.3.8. [Gentian Violet](#)
 - 2.5.3.9. [Gun Blueing](#)
 - 2.5.3.10. [Leucocrystal Violet \(LCV\)](#)
 - 2.5.3.11. [Ninhydrin](#)
 - 2.5.3.12. [Oil Red O](#)
 - 2.5.3.13. [Physical Developer \(PD\)](#)
 - 2.5.3.14. [R.A.Y. Dye Stain](#)
 - 2.5.4. Test Impressions
 - 2.5.4.1. Magnetic Powder
 - 2.5.4.2. Shoe wax, Vaseline®, or similar substance
 - 2.5.4.3. Ink
 - 2.5.4.4. Chart Board
 - 2.5.4.5. BIO-FOAM®

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- 2.5.4.6. Dental Stone
- 2.5.4.7. Lifters
- 2.5.4.8. Acrylic Spray or Hairspray
- 2.5.4.9. SnowPrint Wax™

2.6. Hazards/Safety:

- 2.6.1. All analysts shall utilize appropriate safe work practices when handling chemicals and solvents used in latent print processing procedures. Safe work practices include:
 - 2.6.1.1. Wearing personal protective equipment (PPE) such as gloves, laboratory coat, eye protection, etc. when handling any chemicals.
 - 2.6.1.2. Making sure that all engineering controls, such as ventilation hoods, chemical storage cabinets, etc., are used properly.
 - 2.6.1.3. Employing clean work habits such as washing hands after the preparation of chemical solutions (even though gloved).
 - 2.6.1.4. No eating or drinking in the analytical work areas of the laboratory.
- 2.6.2. Specific hazards regarding chemicals and other processes are outlined within the Processing Manual ([Appendix 8](#)).
 - 2.6.2.1. Light Based Methods
 - 2.6.2.1.1. [Alternate Light Source \(ALS\)](#)
 - 2.6.2.1.2. [Reflective Ultra-violet Imaging System \(RUVIS\)](#)
 - 2.6.2.1.3. [TracER Laser](#)
 - 2.6.2.2. Physical Based Methods
 - 2.6.2.2.1. [Fingerprint Powders](#)
 - 2.6.2.2.2. [Small Particle Reagent \(SPR\)](#)
 - 2.6.2.2.3. [Sticky Side Powder](#)
 - 2.6.2.3. Chemical Based Methods
 - 2.6.2.3.1. [Acid Yellow 7](#)
 - 2.6.2.3.2. [Amido Black](#)
 - 2.6.2.3.3. [Ardrox](#)
 - 2.6.2.3.4. [Chemical Fuming](#)
 - 2.6.2.3.5. [Coomassie Brilliant Blue](#)
 - 2.6.2.3.6. [Cyanoacrylate Fuming](#)
 - 2.6.2.3.7. [1, 8-Diazafluoren-9-one \(DFO\)](#)
 - 2.6.2.3.8. [Gentian Violet](#)
 - 2.6.2.3.9. [Gun Blueing](#)
 - 2.6.2.3.10. [Leucocrystal Violet \(LCV\)](#)
 - 2.6.2.3.11. [Ninhydrin](#)
 - 2.6.2.3.12. [Oil Red O](#)
 - 2.6.2.3.13. [Physical Developer \(PD\)](#)
 - 2.6.2.3.14. [R.A.Y. Dye Stain](#)
- 2.6.3. Other hazards include:
 - 2.6.3.1. Dental Stone – [Irritant](#).
 - 2.6.3.2. Dust and Dirt Hardener – [Irritant](#). [Flammable](#).
 - 2.6.3.3. Snow Print Wax – [Irritant](#). [Flammable](#).

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2.7. Reference Materials/Controls/Calibration Checks:

2.7.1. Controls for each processing method are outlined in the Processing Manual ([Appendix 8](#)).

2.7.1.1. Light Based Methods

2.7.1.1.1. [Alternate Light Source \(ALS\)](#)

2.7.1.1.2. [Reflective Ultra-violet Imaging System \(RUVIS\)](#)

2.7.1.1.3. [TracER Laser](#)

2.7.1.2. Physical Based Methods

2.7.1.2.1. [Fingerprint Powders](#)

2.7.1.2.2. [Small Particle Reagent \(SPR\)](#)

2.7.1.2.3. [Sticky Side Powder](#)

2.7.1.3. Chemical Based Methods

2.7.1.3.1. [Acid Yellow 7](#)

2.7.1.3.2. [Amido Black](#)

2.7.1.3.3. [Ardrox](#)

2.7.1.3.4. [Chemical Fuming](#)

2.7.1.3.5. [Coomassie Brilliant Blue](#)

2.7.1.3.6. [Cyanoacrylate Fuming](#)

2.7.1.3.7. [1, 8-Diazafluoren-9-one \(DFO\)](#)

2.7.1.3.8. [Gentian Violet](#)

2.7.1.3.9. [Gun Blueing](#)

2.7.1.3.10. [Leucocrystal Violet \(LCV\)](#)

2.7.1.3.11. [Ninhydrin](#)

2.7.1.3.12. [Oil Red O](#)

2.7.1.3.13. [Physical Developer \(PD\)](#)

2.7.1.3.14. [R.A.Y. Dye Stain](#)

2.7.2. Calibration checks for instruments and equipment are outlined in the Instrument Calibration and Maintenance Manual ([Appendix 9](#)).

2.7.2.1. [Alternate Light Source \(ALS\)](#)

2.7.2.2. [Balances](#)

2.7.2.3. [Cyanoacrylate Fuming Cabinet](#)

2.7.2.4. [Chemical Exhaust Hoods](#)

2.7.2.5. [Digital Cameras](#)

2.7.2.6. [Heat/Humidity Chamber](#)

2.7.2.7. [Laser](#)

2.7.2.8. [Reflective Ultra-Violet Imaging System \(RUVIS\)](#)

2.7.2.9. [Scales/Rulers](#)

2.7.2.10. [Shoeprint Image Capture and Retrieval \(SICAR\)](#)/Tread Assistant

2.7.2.11. [Table-top Exhaust Hoods](#)

2.7.2.12. [Ultra-violet \(UV\) Crosslinker](#)

2.8. Procedures/Instructions:

2.8.1. Procedures to Prevent DNA Contamination

2.8.1.1. Personal protective equipment (PPE) shall be worn when an item is open that is also to be examined by the Biology Unit. PPE includes a closed/buttoned lab coat, gloves (Nitrile or equivalent), and a face mask (covering nose and mouth).

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- 2.8.1.2. The analyst's coat, gloves, and face mask shall be changed as needed to prevent contamination.
- 2.8.1.3. The analyst should choose the best work area for their examination, and the work area shall be cleaned with a 70% Ethanol or 5% dilution bleach solution both prior to and after each item is examined.
- 2.8.1.4. All instruments/tools/writing utensils shall be cleaned with a 70% Ethanol or 5% dilution bleach solution both prior to and after each item is examined.
- 2.8.2. Common Sources of DNA Contamination**
 - 2.8.2.1. The analyst touches their skin with their gloves.
 - 2.8.2.2. The analyst touches/adjusts their eyeglasses.
 - 2.8.2.3. The analyst touches/uses pens, markers, or reagent bottles that have not been decontaminated.
 - 2.8.2.4. The analyst's lab coat is dirty, and the analyst touches the lab coat with their gloves.
 - 2.8.2.5. Another analyst or person is in the examination area without PPE.
 - 2.8.2.6. An analyst is talking around the evidence without wearing a face mask.
- 2.8.3. Combined Footwear/Tire Impression/DNA Examination Requests**
 - 2.8.3.1. The Biology Unit should analyze the item first whenever possible. If the footwear/tire examination is to be completed first, ensure all previously mentioned PPE and cleaning procedures are followed.
 - 2.8.3.2. If the footwear/tire examination shall be completed first and the Biologist is screening for e-cells, then it is recommended not to process with any wet chemistry.
 - 2.8.3.3. When the item is in the possession of the Biologist and the item *has* a Footwear/Tire Impression Examination Request:
If the Footwear/Tire Impression Analyst looks at the item and no footwear/tire impressions are found, the Footwear/Tire Impression Analyst shall write a report for the item.
 - 2.8.3.3.1. If the Footwear/Tire Impression Analyst looks at an item and there are footwear/tire impressions visible, the Footwear/Tire Impression Analyst shall consult with the Biologist on where to collect biological samples. When possible, hand to hand transfer of the evidence in an unpackaged condition will help prevent damage to any footwear/tire impressions. The Biologist can repackage the item to preserve it for footwear/tire impression analysis. Then, after the full footwear/tire examination, the Footwear/Tire Impression Analyst shall write a report for the item.
 - 2.8.3.4. When the item is in possession of the Biologist and the item *does not* have a Footwear/Tire Impression Examination Request:
 - 2.8.3.4.1. If the Footwear/Tire Impression Analyst looks at the item and no footwear/tire impressions are found,

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then the Footwear/Tire Impression Analyst can create a footwear/tire examination request in LIMS-Plus JusticeTrax and write a report for the item.

2.8.3.4.2. If the Footwear/Tire Impression Analyst looks at the item and there are footwear/tire impressions visible, the Investigator shall be contacted to determine if a footwear/tire examination is probative to the case. Communication with the Investigator shall be disseminated in LIMS-Plus JusticeTrax. If the footwear/tire examination is probative, then the Footwear/Tire Impression Analyst shall create a footwear/tire examination request in LIMS-Plus JusticeTrax; and after the full footwear/tire examination, write a report for the item.

2.8.3.5. When the item is in possession of the Footwear/Tire Impression Analyst and the item *has* a Biology Examination Request:

2.8.3.5.1. If the Biologist looks at the item and there are no biological stains, the Biologist is responsible for writing a report for the item.

2.8.3.5.2. If the Biologist looks at the item and there are biological stains or possible biological stains, the Biologist is responsible for writing a report for the item after the full biology examination.

2.8.3.6. When the item is in the possession of the Footwear/Tire Impression Analyst and the item *does not* have a Biology Examination Request:

2.8.3.6.1. If the Biologist looks at the item and there are no visible biological stains, no further action is required.

2.8.3.6.2. If the Biologist looks at the item and there are no visible biological stains, but the Biologist used an analytical process or chemical test, then the Biologist is responsible for creating a biology examination request in LIMS-Plus JusticeTrax and writing a report for the item.

2.8.3.6.3. If the Biologist looks at the item and there are biological stains or possible biological stains, the Investigator shall be contacted to determine if a biology examination request is probative to the case. Communication with the Investigator shall be disseminated in LIMS-Plus JusticeTrax. If the biology examination is probative, then the Biologist should create a biology examination request in LIMS-Plus JusticeTrax and after the full biology examination, write a report for the item.

2.8.3.6.4. If a situation arises that does not fit one of the previously listed scenarios, consult with a Unit Supervisor or Laboratory Manager.

2.8.4. Combined Footwear/Tire Impression/Trace Examinations

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- 2.8.4.1. If an item is submitted for footwear/tire examination which contains material (such as glass fragments) that is to be analyzed by the Trace Unit, a Trace Analyst shall be contacted to determine if the material is safe and if the material should be separated from the item.
- 2.8.4.2. If any additional questions arise as to the proper sequence for examination or to the proper protocols for combined examinations, consult with a Unit Supervisor or Laboratory Manager.
- 2.8.5. Examination and processing of evidence for the presence of footwear/tire impressions should be completed according to the Processing Manual ([Appendix 8](#)).
- 2.8.6. The Analysis of a footwear/tire impression is the assessment of a footwear/tire impression to determine its suitability for comparison. The value of footwear/tire impressions is assessed according to the Quality (clarity) and Quantity (amount) of detail they possess.
 - 2.8.6.1. The following are factors that affect the value of the footwear/tire impression:
 - 2.8.6.1.1. Collection Method –
 - 2.8.6.1.1.1. Photographs – The quality of the photographs affects the examiner's ability to analyze the impression. Things to consider include:
 - 2.8.6.1.1.1.1. File Format (JPEG, TIFF, RAW, etc)
 - 2.8.6.1.1.1.2. Focus Issues
 - 2.8.6.1.1.1.3. Scale presence and placement
 - 2.8.6.1.1.1.4. If multiple angles of lighting were used
 - 2.8.6.1.1.2. Casts – The proper mixing and pouring of the casting material can affect the examiner's ability to analyze the impression. Things to consider include:
 - 2.8.6.1.1.2.1. Pour lines in the casting material
 - 2.8.6.1.1.2.2. How the cast was cleaned
 - 2.8.6.1.1.2.3. Any breaking of the cast
 - 2.8.6.1.1.2.4. Anything adhering to the casting material (e.g. rocks, grass, paint, snow wax, etc.)
 - 2.8.6.1.2. Matrix – The matrix is the substance in which the impression is made (e.g. dirt, blood, oil, dust, etc.).
 - 2.8.6.1.3. Type of Impression – Footwear/Tire Impressions can be 2-dimensional (2D) or 3-dimensional (3D).
 - 2.8.6.1.4. Substrate – The substrate is the surface in/on which the impression is made (e.g. dirt, mud, snow, wood, metal, concrete, tile, linoleum, etc.).
 - 2.8.6.1.5. Background Interference – Any variation in background appearance can affect the visibility of the impression. Background interference can be caused by such things as: water spots, leaves and/or

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sticks, stones, texture on the floor/surface, dust particles, multi-colored tile/linoleum, etc.

- 2.8.6.1.6. Class Characteristics - Characteristics which are created during the manufacturing process and are shared by one or more other shoes or tires. Class characteristics include size, shape, and tread design, and can be broken down into three levels:

- 2.8.6.1.6.1. Level One Detail consists of the general shape of a footwear or tire impression. Level one detail may include information enabling orientation (heel and/or toe, left or right shoe).

- 2.8.6.1.6.2. Level Two Detail consists of the shape of the tread elements (tread design).

- 2.8.6.1.6.3. Level Three Detail consists of small patterns that may be found on the tread elements.

- 2.8.6.1.7. Individual Characteristics - Characteristics which occur as a result of something that is randomly added or removed from the tread, usually through the wearing of the tread. Individual characteristics can be broken down into three levels:

- 2.8.6.1.7.1. Level One Detail consists of the presence of an identifying characteristic.

- 2.8.6.1.7.2. Level Two Detail consists of the shape of the identifying characteristic (e.g. long and narrow, circular, irregular shaped, etc.).

- 2.8.6.1.7.3. Level Three Detail refers to the small shapes on the edges of each identifying characteristic. Level three detail also includes microscopic patterns of ridges that develop on rubber material as a result of abrasive forces, called Schallamach pattern.

- 2.8.6.1.8. Wear - The erosion of the surfaces of a footwear outsole or tire tread through use. Wear results in the continuous alteration of class and identifying characteristics. While wear may begin as just a general wear pattern, when it advances, it can result in extreme wear to the point of tearing of the tread, which can be used for identification.

- 2.8.6.2. Impressions that contain sufficient detail to warrant a comparison in the opinion of the analyst are deemed to be "suitable for comparison." If there are impressions deemed "suitable for comparison" either:

- 2.8.6.2.1. proceed to the comparison step if there are known shoes/tires, or

- 2.8.6.2.2. proceed to Shoeprint Image Capture and Retrieval (SICAR)/Tread Assistant entry if they are suitable for SICAR/Tread Assistant entry.

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2.8.6.2.3. Impressions that do not contain any distinguishable shapes to warrant a comparison in the opinion of the analyst are deemed to be “no value.”

2.8.7. The Analysis of a shoe/tire is the collection of information about a shoe or tire to be used during the comparison process.

2.8.7.1. Manufacturer – The manufacturer can be useful in attaining other information about the shoe/tire which can assist in determining the rarity of the shoe/tire, such as:

2.8.7.1.1. Where the shoes/tires are made and distributed.

2.8.7.1.2. Manufacturing Process – How the shoes/tires are manufactured can affect the rarity of the shoe/tire (e.g. die-cut shoes versus injection molded shoes, defects in the mold, the number of molds, stippling in the mold, etc.).

2.8.7.2. Size – The physical size of the shoe/tire can be compared using overlays/ transparencies and/or calipers.

2.8.7.3. Type – Type of shoes/tires are considered during comparison. Types of shoes include boots, dress, athletic, etc. Types of tires include passenger, small truck, off-road, etc.

2.8.7.4. Condition – The condition of the shoe/tire can assist in determining the likelihood of the shoe/tire to contain identifying characteristics as well as the shoe/tire’s last location (e.g. is it bloody, muddy, dusty, etc.).

2.8.7.5. Tread Pattern – The tread pattern is the manufacturing design on the tread of the shoe/tire.

2.8.7.6. Wear – The areas worn on the shoes should be used during comparison; and if extreme wear or Schallamach is present, wear can be used for identification.

2.8.7.7. Identifying characteristics – Anything that has been randomly added or removed from the tread can be used for identification (e.g. rocks, gum, cuts, gouges, etc.).

2.8.8. If after the analysis of the unknown impressions, the analyst determines additional processing of evidence for the presence of footwear/tire impressions would be beneficial, then processing should be completed according to the Processing Manual ([Appendix 8](#)).

2.8.9. Test Impressions of the Known Shoes/Tires:

2.8.9.1. Test impressions shall be made from the known shoes/tires unless there is an obvious exclusion (i.e. tread design). Test impressions are used in conjunction with the known shoe/tire for comparison with the unknown impression.

2.8.9.2. Footwear Test Impressions:

2.8.9.2.1. Footwear test impressions shall record fine detail with good contrast and be suitable for use in the comparison process.

2.8.9.2.2. Footwear test impressions shall be made to try to reproduce the unknown impression to the best of the analyst’s ability (e.g. 2D, 3D, kick, soft or hard surface).

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- 2.8.9.2.3. The initial test impression should be made of the entire shoe. Once an area has been narrowed down to focus on, additional test impressions can be made of just that area.
- 2.8.9.2.4. Excess dirt should be removed from the shoe with care so as not to damage the outsole before test impressions are made.
- 2.8.9.2.5. Prior to wearing the shoe, consider contamination issues.
- 2.8.9.2.6. Various materials/methods can be used to make test impressions, these include, but are not limited to:
 - 2.8.9.2.6.1. Clear shoe wax, Vaseline, (or other similar substance) and magnetic powder
 - 2.8.9.2.6.1.1. Coat the outsole with the selected substance.
 - 2.8.9.2.6.1.2. Make an impression by either wearing the shoe or pressing the shoe against a piece of white copy paper.
 - 2.8.9.2.6.1.3. Develop the impression with magnetic fingerprint powder.
 - 2.8.9.2.6.2. Powdering and lifting
 - 2.8.9.2.6.2.1. Apply a heavy coat of fingerprint powder to the outsole.
 - 2.8.9.2.6.2.2. Remove any excess by gently tapping the shoe.
 - 2.8.9.2.6.2.3. Remove protective cover from adhesive lift.
 - 2.8.9.2.6.2.4. Make an impression by either wearing the shoe or by pressing the adhesive to the shoe.
 - 2.8.9.2.6.2.5. Cover the impression with a protective sheet.
 - 2.8.9.2.6.3. Ink
 - 2.8.9.2.6.3.1. Apply thin coat of ink to the outsole.
 - 2.8.9.2.6.3.2. Make an impression by wearing the shoe or pressing the shoe against a piece of white copy paper.
 - 2.8.9.2.6.4. BIO-FOAM®
 - 2.8.9.2.6.4.1. Make an impression in BIO-FOAM.
 - 2.8.9.2.6.4.2. Use the resulting impression for comparison to 3D impressions.
 - 2.8.9.2.6.4.3. The BIO-FOAM impression can be photographed for comparison.
 - 2.8.9.2.6.4.4. The BIO-FOAM impression can be filled with dental stone for comparison.
 - 2.8.9.2.6.5. Flour (or similar medium) and photography

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- 2.8.9.2.6.5.1. Make an impression in the flour.
 - 2.8.9.2.6.5.2. The flour impression can be photographed for comparison.
 - 2.8.9.3. Tire Test Impressions:
 - 2.8.9.3.1. Tire test impressions shall record fine detail with good contrast and be suitable for use in the comparison process.
 - 2.8.9.3.2. Tire test impressions shall record the full and continuous circumference of a tire.
 - 2.8.9.3.3. Tire test impressions should, when possible, be made with the tire mounted on a vehicle.
 - 2.8.9.3.4. Excess dirt should be carefully removed from the tire before test impressions are made.
 - 2.8.9.3.5. Record the tire manufacturer, make, size, Department Of Transportation number, and other relevant information.
 - 2.8.9.3.6. Mark the wear bars on the tire with numbers/letters. These are then used to indicate tire location on the chart board.
 - 2.8.9.3.7. Various materials/methods can be used to make test impressions, these include, but are not limited to:
 - 2.8.9.3.7.1. Ink with chart board
 - 2.8.9.3.7.1.1. Prepare enough chart board to record two full rotations of the tire, if possible.
 - 2.8.9.3.7.1.2. Apply a light coat of ink to the tire surface.
 - 2.8.9.3.7.1.3. Roll the vehicle over the chart board by pushing the vehicle while the vehicle is in neutral.
 - 2.8.9.3.7.1.4. Mark the chart board with the relevant information (information on the tire, tire position, direction of travel, etc.).
 - 2.8.9.3.7.1.5. Allow ink to dry before folding.
 - 2.8.9.3.7.2. Vaseline (or similar substance) and magnetic powder with chart board
 - 2.8.9.3.7.2.1. Prepare enough chart board to record two full rotations of the tire, if possible.
 - 2.8.9.3.7.2.2. Apply a light coat of Vaseline to the tire surface.
 - 2.8.9.3.7.2.3. Roll the vehicle over the chart board by pushing the vehicle while the vehicle is in neutral.
 - 2.8.9.3.7.2.4. Mark the chart board with the relevant information (information on

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- the tire, tire position, direction of travel, etc.).
 - 2.8.9.3.7.2.5. Develop the impression with magnetic fingerprint powder.
 - 2.8.9.3.7.2.6. Remove excess powder.
 - 2.8.9.3.7.2.7. Spray the impression with an acrylic spray or hairspray to fix the powdered impression to the chart board.
 - 2.8.9.3.7.2.8. Allow the spray to dry before folding.
 - 2.8.9.4. Overlays/Transparencies can be made from the test impressions. Any overlay/transparency made shall be compared back to the original test impression to ensure it is an accurate representation of the original prior to using the overlay/transparency for comparison to the unknown impression.
 - 2.8.9.5. If test impressions are submitted for comparison, they shall be analyzed to determine their suitability for comparison.
 - 2.8.10.** The Comparison phase of ACE-V Methodology is conducted by using a side-by-side observation and/or superimposition of unknown footwear/tire impressions to the known shoes/tires to determine whether they have a common origin based on class and identifying characteristics.
 - 2.8.10.1. The analyst systematically searches the known footwear or tires in an effort to exclude them as a source or to locate a known source that is consistent with the detail observed in the unknown impression during analysis.
 - 2.8.10.2. Comparisons are conducted in an objective manner beginning with the unknown impression and comparing it to the known impression.
 - 2.8.10.3. Comparisons shall include comparing the tread design, physical shape and size (measurements), manufacturing characteristics, wear characteristics, and identifying characteristics.
 - 2.8.11.** The Evaluation phase of ACE-V Methodology is the formulation of a conclusion based upon the sufficiency of detail and significance of the information observed during the analysis and comparison of footwear/tire impressions. Sufficiency is based on the analyst's training and experience and is defined as being the determination that there is adequate quality and quantity of information to reach a conclusion. The possible conclusions for a footwear/tire impression examination are Identification (Individualization), Exclusion, or Could Have Been Made By:
 - 2.8.11.1. Identification is reached when the known and unknown impressions being compared are in agreement and contain sufficient identifying characteristics to conclude that the particular shoe or tire made the unknown impression.
 - 2.8.11.2. Exclusion is reached when the impressions being compared are in disagreement. Disagreements can include differences in size of the impression, differences in size of the elements, differences in the number of elements, differences in tread design, differences in tread alignment (opposite shoe), etc.

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- 2.8.11.3. The *Could Have Been Made By* finding can result from a variety of situations. These include:
 - 2.8.11.3.1. Class characteristics are in agreement and some limited identifying/wear characteristics are in agreement. There is a lack of sufficient identifying characteristics to effect a conclusion of identification.
 - 2.8.11.3.2. Class characteristics are in agreement only. There is a lack of any identifying characteristics either due to the low quality of the impression or due to the lack of identifying characteristics in the shoe/tire.
 - 2.8.11.3.3. Class characteristics are in agreement but there are some wear and/or identifying characteristics in disagreement. These disagreements could be a result of wear from the time the crime was committed to the time the shoe was collected, and therefore are not sufficient for exclusion.
 - 2.8.11.3.4. Limited quantity of unknown. The unknown impression is limited in the area depicted, but does contain a shape that is also visible in the known shoe/tire.
- 2.8.12. The Verification phase of ACE-V Methodology is the independent application of ACE Methodology by another analyst. An analyst has been qualified to complete verifications once he/she has successfully passed the Indiana State Police Footwear/Tire Impression Training Program and has been released from supervised casework.
 - 2.8.12.1. Note: Identification implies that all other sources are excluded from having made the impression; therefore, verifications of exclusions of an identified impression are unnecessary.
 - 2.8.12.2. A qualified analyst shall verify all footwear/tire impression identifications and all exclusions. Analysts shall not use one verifier exclusively.
 - 2.8.12.3. Resolution of a Technical Variation and/or Conflict
 - 2.8.12.3.1. In the event that there is a technical variation or conflict of opinion during the verification phase, the Unit Supervisor shall be notified and the procedures in the Indiana State Police Laboratory Quality Assurance Manual shall be followed. The analyst shall not seek a second reviewer.
- 2.8.13. If no known shoes or tires are submitted, various references and databases can be used to determine a possible make and model of the shoe/tire. These references and databases include, but are not limited to:
 - 2.8.13.1. SICAR
 - 2.8.13.1.1. SICAR stores shoeprint outsole designs and tire tread designs, which can be searched to locate a potential make and model of shoe that could have made the unknown impression.
 - 2.8.13.1.2. Refer to page 12 of the SICAR manual for information on SICAR coding and entry.

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2.8.13.2. Tread Assistant and Tread Design Guide

2.8.13.2.1. Tread Design Guide is published annually and contains images of tire tread designs for passenger, light truck, medium truck, off-the road, agricultural, motorcycle, and retreads.

2.8.13.2.2. Tread Assistant is a computerized version of the Tread Design Guide. It is a software program which can be searched to locate a potential make and model of a tire.

2.8.13.2.2.1. Refer to Tread Assistant Help for information on Tread Assistant entry.

2.8.13.3. Zappos.com (or other online shoe sites)

2.8.13.3.1. Zappos is an online shoe retailer which sells many brands of shoes and typically has a photograph of the shoe as well as the shoe outsole.

2.8.14. If a footwear impression is submitted and the make and model of the shoe is known, then the impression can be used to determine a possible size range of the shoe(s) that made the impression.

2.8.14.1. The unknown impression shall be sized 1:1.

2.8.14.2. Three or more measurements from defined element edges shall be documented by using a digital or physical scale. At least two of the measurements shall be taken down the length of the unknown impression, not across the width of the impression.

2.8.14.3. At a local shoe store or by contacting the shoe manufacturer, determine measurements of the pre-determined tread locations in various shoe sizes. Document all measurements of the various shoe sizes in the analyst's case notes.

2.8.14.4. Evaluate the recorded measurements to determine which shoe sizes correspond with the unknown impression, allowing for any foot slippage or distortion due to scale placement.

2.9. Records: Documentation shall be to the extent that another qualified analyst would be able to determine each examination activity conducted, their sequence, results of the activities, and any conclusions reached. Although all examinations require documentation, the extent of the documentation is related to the complexity of the examination. Footwear/tire documentation shall be made contemporaneous to the time of the examination and shall be prepared using Microsoft Word storing the digital images in Mideo Caseworks. This documentation will be a part of the case file.

2.9.1. General Information

2.9.1.1. Analyst's name

2.9.1.2. Laboratory case number

2.9.1.3. Page numbers

2.9.1.4. Dates the work was performed.

2.9.1.5. An Abbreviation Key in the footer of the document if abbreviations are used

2.9.2. Description of the Evidence

2.9.2.1. Documentation of each Item of Evidence shall include:

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- 2.9.2.1.1. Description of the packaging (ex: brown paper bag, cardboard box, etc.).
 - 2.9.2.1.2. Condition of the packaging (ex: sealed, broken seal, damaged, etc.).
 - 2.9.2.1.2.1. Packaging issues shall be addressed with a Unit Supervisor or Laboratory Manager.
 - 2.9.2.1.3. Description of each item and the number of items.
 - 2.9.2.1.4. Overall photographs of the item(s) should be inserted into the analyst's case notes or a scanned image can be used as documentation instead of a photograph.
 - 2.9.2.1.4.1. Photographs of shoes should include the tag information (typically found on tongue), each side of the shoe, the entire outsole and close-ups of the toe and heel. Photographs shall be uploaded into the Footwear-Tire folder in Mideo Caseworks if they are not inserted directly into the analyst's case notes.
 - 2.9.2.1.4.2. Photographs of casts should be taken after cleaning. Photographs shall be uploaded into the Footwear-Tire folder in Mideo Caseworks if they are not inserted directly into the analyst's case notes.
 - 2.9.2.1.5. The pertinent information on the outside packaging shall either be written down or photographed. Photographs shall be uploaded into the Footwear-Tire folder in Mideo Caseworks if they are not inserted directly into the analyst's case notes.
- 2.9.3. Documentation of Lifts Submitted to the Laboratory for Examination**
- 2.9.3.1. Each lift shall be marked for identification with the analyst's initials, case number, and laboratory item number. Each lift should be marked for identification prior to scanning for documentation purposes.
 - 2.9.3.2. Each impression suitable for comparison shall be labeled either on the lift itself, or on the scanned image of the lift.
 - 2.9.3.3. Regardless of the value of the impressions, the front of every lift shall be scanned and uploaded into the Footwear-Tire folder in Mideo Caseworks. The back of every lift shall also be scanned and uploaded into the Footwear-Tire folder in Mideo Caseworks except for the back of lifts that are blank. The image(s) of the back of the lifts shall be clearly labeled to correspond with the image(s) of the front of the lifts.
- 2.9.4. Documentation of Casts Submitted to the Laboratory for Examination**
- 2.9.4.1. Each cast shall be marked for identification with the analyst's initials, case number, and laboratory item number.
 - 2.9.4.2. Most casts should only contain one impression; however, if multiple impressions are observed, they shall be labeled on a photograph of the cast.

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- 2.9.4.3. Each impression should be photographed using multiple angles of light and lighting from multiple heights. These photographs shall be uploaded into the Footwear-Tire folder in Mideo Caseworks.
- 2.9.4.4. Document the condition of the cast (was it cleaned, how was it cleaned, was it broken, are there things in the casting material [rocks, grass, snow print wax], etc.).
- 2.9.5.** Documentation of Electrostatic Dust Print Lifts Submitted to the Laboratory for Examination
 - 2.9.5.1. Each lift shall be marked for identification with the analyst's initials, case number, and laboratory item number.
 - 2.9.5.2. Each impression suitable for comparison shall be labeled either on the lift itself, or on the photograph of the lift.
 - 2.9.5.3. Each impression shall be photographed. These photographs shall be uploaded into the Footwear-Tire folder in Mideo Caseworks.
- 2.9.6.** Documentation of Photographs Submitted to the Laboratory for Examination.
 - 2.9.6.1. Digital Photographs
 - 2.9.6.1.1. Document the serial number of the CD, DVD, etc.
 - 2.9.6.1.2. Mark the CD, DVD for identification with the analyst's initials, case number, and laboratory item number.
 - 2.9.6.1.3. Document the file format of the photographs (JPEG, TIFF, RAW, etc.).
 - 2.9.6.1.4. If there are multiple photographs of the same impression, note which impressions are in each photograph, for example:
 - 2.9.6.1.4.1. DSC_010 to DSC_016 – Impression A
 - DSC_017 to DSC_018 – Impression B
 - DSC_019 – Impressions A&B
 - 2.9.6.1.5. Each impression suitable for comparison shall be labeled. This can be completed in Adobe Photoshop or Mideo Workspace.
 - 2.9.6.2. Printed Photographs
 - 2.9.6.2.1. Each photograph shall be marked for identification with the analyst's initials, case number, and laboratory item number.
 - 2.9.6.2.2. If there are multiple photographs of the same impression, note which impressions are in each photograph. This may be done by numbering the photographs and documented in the case notes which numbers contained which impressions.
 - 2.9.6.2.3. Each impression suitable for comparison shall be labeled.
 - 2.9.6.3. In the analysis of each photograph, the analyst shall document if there are focus issues, if there is a scale present, and if there are any issues with the scale (in a different plane, only a measuring tape used instead of a flat scale, etc.).

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- 2.9.6.4. The analyst shall document which photographs were sized, enhanced, and used for comparison, if there are multiple photographs of the same impression.
- 2.9.6.5. The analyst shall upload every submitted photograph intended for comparison regardless of the value of the photograph into the Footwear-Tire folder in Mideo Caseworks.
 - 2.9.6.5.1. Photographs captured by the analyst that will be used for comparison purposes shall be uploaded in the Footwear-Tire folder in Mideo Caseworks.
 - 2.9.6.5.2. If a photograph contains multiple impressions, each impression shall be labeled with a unique identifier.
- 2.9.6.6. General Crime Scene Photographs
 - 2.9.6.6.1. If general crime scene photographs are included, this shall be documented with an indication of how many photographs are of general crime scene.
 - 2.9.6.6.1.1. If the analyst retains general crime scene photographs, they shall be uploaded into the Non-Casework Images folder in Mideo Caseworks.
- 2.9.7. Documentation of Shoes/Tires Submitted for Comparison**
 - 2.9.7.1. Each shoe/tire shall be analyzed separately. The analysis of shoes/tires shall include:
 - 2.9.7.1.1. Appearance: Note the make and model, size, and color of shoes.
 - 2.9.7.1.2. Condition: Note if the shoes are clean, dirty, appear old or new.
 - 2.9.7.1.3. Tread Pattern: Describe the tread pattern.
 - 2.9.7.1.4. Wear: Note any wear patterns, including extreme wear and Schallamach.
 - 2.9.7.1.5. Identifying Characteristics: Note if there are identifying characteristics present (e.g. cuts, gouges, rocks, gum, etc.).
- 2.9.8. Documentation of Test Impressions Used for Comparison**
 - 2.9.8.1. Each page of test impressions shall be marked for identification with the analyst's initials, case number, and laboratory item number. Each page of the test impressions should be marked for identification prior to being photographed or scanned for documentation purposes.
 - 2.9.8.2. Test impressions shall be photographed or scanned at a minimum of 500 ppi and uploaded into the Footwear-Tire folder in Mideo Caseworks
 - 2.9.8.3. Test impressions may also be scanned into Adobe Photoshop or the Footwear-Tire folder in Mideo Caseworks for comparison purposes.
 - 2.9.8.4. Any test impressions that need digital enhancement for comparison shall be uploaded into the Footwear-Tire folder in Mideo Caseworks prior to enhancement so that the

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enhancement is recorded in the Footwear-Tire folder in Mideo Caseworks with the audit trail.

- 2.9.8.5. If test impressions are of poor quality and are not suitable for comparison, this shall be documented in the analyst's case notes. Higher quality test impressions shall be requested in the analyst's report.
- 2.9.9. Documentation of Test Impressions Created by the Analyst for Comparison**
 - 2.9.9.1. Document how the test impressions were made, including what materials were used, how the impression was made, on what surface the impression was made and the clarity of the test impressions.
 - 2.9.9.2. Document if overlays/transparencies were made and how they were made (e.g. photocopier, scanned and printed on photo printer).
 - 2.9.9.3. Test impressions shall be marked for identification with the analyst's initials, case number, laboratory item number, and shoe or tire identifier (left, right, front, back).
 - 2.9.9.3.1. The test impressions which were created and used for comparison should be uniquely identified and documented in the case notes.
 - 2.9.9.4. All test impressions (e.g. transparencies, BIO-FOAM, casts, powder test impressions, etc.) that are made during the examination process shall be kept and made into a new item.
 - 2.9.9.5. At least one test impression of each shoe shall be scanned at a minimum of 500 ppi and uploaded into LIMS-Plus JusticeTrax or the Footwear-Tire folder in Mideo Caseworks for documentation purposes.
 - 2.9.9.6. Test impressions can be scanned into Adobe Photoshop or the Footwear-Tire folder in Mideo Caseworks at a high resolution for comparison purposes.
 - 2.9.9.7. If an identification is made, the test impression used for identification shall be plotted and charted along with the footwear/tire impression, and this chart shall be uploaded into the Footwear-Tire folder in Mideo Caseworks.
- 2.9.10. Documentation of Item Processing / Actions Taken**
 - 2.9.10.1. If an item has multiple examination requests and the item is examined in the presence of another analyst, this shall be documented in the analyst's case notes.
 - 2.9.10.1.1. Document the name of the analyst and any actions taken by that analyst.
 - 2.9.10.1.1.1. Example: Item X was opened in the presence of Serologist, John Doe. He swabbed the textured rubber grip area on Item X.
 - 2.9.10.2. If a sub-item or a new item is created from an item in your custody, this shall be documented in the analyst's case notes.
 - 2.9.10.2.1. Document the date the sub-item or new item was created and what the sub-item or new item contains.

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- 2.9.10.2.1.1. Note: The sub-item shall be created in LIMS-Plus JusticeTrax before returning to Laboratory's evidence storage.
- 2.9.10.3. All processing techniques utilized need to be documented. Prior to the use of any chemical, a reagent check needs to be completed and this shall be documented in the case notes.
- 2.9.10.4. If there are multiple Cyanoacrylate Fuming Cabinets in a regional laboratory, the analyst shall document which Cyanoacrylate Fuming Cabinet was utilized throughout the case.
- 2.9.10.5. Equipment used in the visualization of an impression (e.g. ALS, Laser, RUVIS) should be documented in the analyst's case notes.
- 2.9.10.6. Once all processing is completed, each item should be marked for identification with the analyst's initials, case number, and laboratory item number. If an item is not marked for identification, the reason shall be documented in the analyst's case notes.
- 2.9.10.7. Casts, Gel-lifts, and Electrostatic Dust Lifts shall be flipped prior to comparison as they are reverse/mirror images of the actual impression. All images that are flipped should be labeled as such, and it should be documented in the analyst's case notes.
- 2.9.11. Documentation of any Developed Footwear/Tire Impressions**
 - 2.9.11.1. Each item(s) shall be visually examined prior to any processing. If any footwear/tire impressions of value for comparison are observed, they shall be documented in the analyst's case notes and photographed.
 - 2.9.11.2. After each processing step, the item(s) shall be examined to determine if any additional footwear/tire impressions of value were developed.
 - 2.9.11.2.1. If no footwear/tire impressions were developed, this shall be documented in the analyst's case notes.
 - 2.9.11.2.2. If footwear/tire impressions were developed, but there was insufficient detail for comparison, this shall be documented in the analyst's case notes. However, these impressions need not be photographed.
 - 2.9.11.2.3. If footwear/tire impressions were developed that may be suitable for comparison, they shall be photographed and these photographs retained in the Footwear-Tire folder in Mideo Caseworks as part of the analyst's case notes.
 - 2.9.11.2.4. If a footwear/tire impression is observed/developed after multiple steps, it need not be photographed each time if the contrast is not improved; however, if an observed/developed footwear/tire impression is photographed, at least one photograph from each step shall be uploaded into the Footwear-Tire folder in Mideo Caseworks.

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2.9.12. Documentation of Analysis

- 2.9.12.1. Footwear/Tire Impressions not suitable for Comparison:
 - 2.9.12.1.1. It shall be documented in the analyst's case notes as to why the impression was determined to be not suitable.
- 2.9.12.2. Footwear/Tire Impressions suitable for Comparison:
 - 2.9.12.2.1. Analysis shall be documented through written notes, plotting, and/or tracing.
 - 2.9.12.2.2. The following factors should be considered during analysis:
 - 2.9.12.2.2.1. Matrix: Document if possible, in what substance/matrix the impression appears (sweat, blood, oil, etc.).
 - 2.9.12.2.2.2. Substrate/Surface: Document which type of surface the impression was made (2D, 3D, wood, metal, concrete, tile, linoleum, etc.).
 - 2.9.12.2.2.3. Area of Impression: Document what area the impression appears to depict (toe, heel, left, right).
 - 2.9.12.2.2.4. Background Interference: Document if there is any noise or interference in the background (textured floor, multi-colored tile, water spots, reflective dust particles, rocks or grass in cast, etc.)
 - 2.9.12.2.2.5. General Tread Design: Document if it is visible, and describe its appearance.
 - 2.9.12.2.2.6. Wear: Document possible wear patterns, Schallamach, etc.
 - 2.9.12.2.2.7. Identifying characteristics: Document if possible identifying characteristics are observed.
 - 2.9.12.2.2.8. Red Flags: any obvious signs of distortion, slippage, overlapping impressions, etc.

2.9.13. Documentation of Comparison

- 2.9.13.1. Similarities or differences in tread design, size, and shape shall be documented.
 - 2.9.13.1.1. Be able to differentiate between the terms "variation" and "difference." Variations in appearance can be due to slippage, movement, substrate, matrix, etc. Differences are disagreements due to the tread design itself, i.e. tread elements are sized differently, alignment is different (left versus right shoe), size of impression is different, etc.
- 2.9.13.2. If wear is present, agreement or disagreement shall be documented.
- 2.9.13.3. If identifying characteristics are present, agreement or disagreement, and what the type of identifying characteristics are

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present (cuts, gouges, rocks in the tread, gum in the tread, etc.), shall be documented.

2.9.13.4. Consultations of footwear/tire impression comparisons shall be documented in the analyst's case notes.

2.9.13.4.1. Note: If an analyst has consulted on a particular impression, then the assisting analyst shall not do the verification of that impression.

2.9.14. Documentation of Evaluation

2.9.14.1. If an identification is made, the identifying characteristics that are found to be in agreement shall be plotted or charted on the unknown impression and known test impression or on the photograph of the footwear/tire. This chart shall be labeled and uploaded into the Footwear-Tire folder in Mideo Caseworks, and may be inserted into the analyst's case notes.

2.9.14.2. If the conclusion is a *could have been made by*, but there are limited identifying characteristics in agreement, these identifying characteristics shall be plotted or charted on the unknown impression and known test impression or on the photograph of the footwear/tire. This chart shall be labeled and uploaded into the Footwear-Tire folder in Mideo Caseworks, and may be inserted into the analyst's case notes.

2.9.14.2.1. Note: *Could have been made by* conclusions in which the unknown and the known share only class characteristics do not need to be plotted.

2.9.14.3. Exclusions due to difference in tread design or tread alignment do not need to be plotted.

2.9.14.4. Exclusions in which the unknown impression and known source share tread design, but are excluded due to size or other differences shall be documented either by recording differences in size measurements or plotting the differences (such as differences in wear patterns or identifying characteristics). These plots/charts shall be labeled and uploaded into the Footwear-Tire folder in Mideo Caseworks, and can also be inserted into the analyst's case notes.

2.9.15. Documentation of Verification

2.9.15.1. When an identification or exclusion is made, the name of the verifier shall be documented in the analyst's case notes, and shall be documented through email which will be uploaded into LIMS-Plus JusticeTrax (see [Appendix 7](#)).

2.9.15.2. A technical variation and/or conflict of opinion between the initial analyst and the verifier shall be documented in the analyst's case notes

2.9.15.2.1. The resolution process of a technical variation or conflict of opinion shall be documented in the analyst's case notes. In addition, all plottings from the initial analyst, the verifier, and any other individual(s) involved in the resolution shall be

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documented in the Footwear-Tire folder in Mideo Caseworks.

2.9.16. Documentation of Database Searches

- 2.9.16.1. If an impression is entered into SICAR or Tread Assistant, this shall be documented.
- 2.9.16.2. If a potential make and model shoe or tire is found that could have made the impression, the images of the potential shoe or tire shall be included as part of the analyst's case notes.

2.9.17. Miscellaneous Documentation

- 2.9.17.1. Communication with a member of a Criminal Justice Agency.
 - 2.9.17.1.1. If an officer or investigator is contacted regarding the examination of the case, it shall be documented in the analyst's case notes.
 - 2.9.17.1.2. If the information discussed affects another unit, it shall also be documented in LIMS-Plus JusticeTrax in the dissemination report.
 - 2.9.17.1.3. If information (such as a case report or case notes) is being released to another Criminal Justice agency, this shall be documented in LIMS-Plus JusticeTrax in the dissemination report.
- 2.9.17.2. Laboratory Policy
 - 2.9.17.2.1. If evidence is in an analyst's custody for more than 45 days, a Unit Supervisor shall be notified and the reason why it has been in the analyst's custody over 45 days shall be documented in the analyst's case notes (Laboratory Policy Evid-001).
 - 2.9.17.2.2. If evidence is left in another analyst's custody temporarily, this shall be documented in the analyst's case notes (Laboratory Policy Evid-001).

2.9.18. Storage of Analyst's Notes

- 2.9.18.1. The analyst can use an approved worksheet as part of their case documentation.
- 2.9.18.2. When striking out a letter or number on a case record document, a single line is to be drawn through the correction and initialed (Indiana State Police Laboratory Quality Assurance Manual); or if the change is made electronically, then version 2 of the document shall be uploaded into LIMS-Plus JusticeTrax.
- 2.9.18.3. The laboratory case number and original handwritten analyst's initials or secure electronic equivalent shall be on each page of examination documentation. When both sides of a page are used, each side shall be treated as a separate page (Indiana State Police Laboratory Quality Assurance Manual).
- 2.9.18.4. Any hand-written notes shall be kept as part of the case documentation. The originals shall be scanned and uploaded into LIMS-Plus JusticeTrax. The original can be destroyed after verifying the original was successfully uploaded.

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- 2.9.18.5. All printed pages and hard copies of notes shall have a digital equivalent. Digital notes will be uploaded into LIMS-Plus JusticeTrax.
- 2.9.18.6. Naming of files that are uploaded into LIMS-Plus JusticeTrax shall follow Laboratory Policy Gen-037.
 - 2.9.18.6.1. Lifts, test impressions, notes, worksheets, Laboratory Submission Forms, etc. shall all be uploaded with appropriate file names. Examples of file names include:
 - LP_10I1234_R1_629_7477_S1
 - LP_10I1234_R1_TCR NOTES_7477_V1
 - LP_12I1234_R1_FINAL NOTES_7477_V1
 - LP_10I1234_R1_I002_5LIFTS_2SIDED_7477_S1
 - LP_10I1234_R1_I005_PHOTO_CAST_7477_P1
 - LP_10I1234_R1_EMAIL VERIFICATION_7477_E1
- 2.9.18.7. All digital imaging documentation shall be stored in the Footwear-Tire folder in Mideo Caseworks.
 - 2.9.18.7.1. All images related to the case shall be documented in either the analyst's case notes or through the appropriate report in Mideo, and the images shall be uploaded to LIMS-Plus JusticeTrax.
- 2.9.19. Additional Data Section in LIMS-Plus JusticeTrax**
 - 2.9.19.1. How to calculate or fill in each field in the Additional Data Section
 - 2.9.19.1.1. # of Items:
 - 2.9.19.1.1.1. Count every item you examined.
 - 2.9.19.1.1.2. Example: A CD containing fifteen photographs would count as 15 items.
 - 2.9.19.1.2. # of Photos:
 - 2.9.19.1.2.1. This is the number of images with impressions that you photographed and uploaded into the Footwear-Tire folder in Mideo Caseworks. Do not count any JPEG or overall item photographs, or photos that were submitted from the contributor.
 - 2.9.19.1.2.1.1. Note: Photos from the contributor should be counted in # of Items.
 - 2.9.19.1.3. # of LOV (Impressions) Developed:
 - 2.9.19.1.3.1. Each impression you consider suitable for comparison is a Latent of Value (LOV).
 - 2.9.19.1.3.2. Do not count the same impression several times if you have photographed it with several processing techniques or if it appears in multiple submitted photographs.
 - 2.9.19.1.4. # of Comparisons

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- 2.9.19.1.4.1. Each comparison to each shoe and each tire (left and right shoe count as two comparisons).
- 2.9.19.1.5. # SICAR Entered
 - 2.9.19.1.5.1. The number of impressions searched in SICAR.
- 2.9.19.1.6. # SICAR Hit
 - 2.9.19.1.6.1. The number of impressions that came back with a potential source of the footwear impression.
- 2.9.19.1.7. # Tread Assistant Entered
 - 2.9.19.1.7.1. The number of impressions searched in Tread Assistant.
- 2.9.19.1.8. # Tread Assistant Hit
 - 2.9.19.1.8.1. The number of impressions that came back with a potential source of the tire impression.
- 2.9.19.1.9. # Id's
 - 2.9.19.1.9.1. The number of identifications.
- 2.9.19.1.10. # Elim's
 - 2.9.19.1.10.1. The number of exclusions.
- 2.9.19.1.11. # Could Be's
 - 2.9.19.1.11.1. The number of could be conclusions.
- 2.9.19.1.12. Other
 - 2.9.19.1.12.1. State if you completed additional research such as a Zappos search, contacting manufacturers, size determination, etc.
- 2.9.19.1.13. Development Processes
 - 2.9.19.1.13.1. Fill in the number of pieces of evidence that you used that process on.
 - 2.9.19.1.13.1.1. Example: For 6 pieces of paper processed with DFO, you would put a number 6 in front of DFO.

2.10. Interpretations of Results: Results are determined based upon the evaluation the analyst has made following the analysis and comparison of the footwear/tire impressions. Conclusions that may be reached are Identification, Exclusion, and Could Have Been Made By.

2.10.1. Identification is reached when the known and unknown impressions being compared are in agreement and contain sufficient identifying characteristics to conclude that the particular shoe or tire made the unknown impression to the degree that likelihood the impression was made by another source is so remote that it is considered as a practical impossibility.

2.10.2. Exclusion is reached when the impressions being compared are in disagreement. Disagreements can include differences in size of the impression, differences in size of the elements, differences in the number of elements, difference in tread design, difference in tread alignment (opposite shoe), etc.

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2.10.3. The *could have been made by* finding can result from a variety of situations. These include:

- 2.10.3.1. Class characteristics in agreement and some limited identifying/wear characteristics in agreement. There is a lack of sufficient identifying characteristics to effect a conclusion of identification.
- 2.10.3.2. Class characteristics in agreement only. There is a lack of any identifying characteristics either due to the low quality of the impression or due to the lack of identifying characteristics in the shoe/tire.
- 2.10.3.3. Class characteristics in agreement but there are some wear and/or identifying characteristics in disagreement. These disagreements could be a result of wear from the time the crime was committed to the time the shoe was collected, and therefore are not sufficient for exclusion.
- 2.10.3.4. Limited quantity of unknown. The unknown impression is limited in the area depicted, but does contain a shape that is also visible in the known shoe/tire.

2.11. Report Writing: The following shall be addressed within the body of the report. The exact wording of the results is left to the analyst's discretion; however, some example report wording guidelines are listed in the next section.

2.11.1. Information to be addressed in the report:

- 2.11.1.1. The number of footwear/tire impressions suitable for comparison on each item.
 - 2.11.1.1.1. Differentiate between impressions that were observed and those that were developed.
 - 2.11.1.1.2. Report out the number of impressions, not the number of photographs with the same impression.
- 2.11.1.2. If a comparison to a test impression or known source is conducted, this shall be stated with the results of that comparison.
 - 2.11.1.2.1. Specify what kind of known impression(s) were compared to (e.g. the shoes/tires themselves, test impressions).
- 2.11.1.3. An association to a specific outsole/tread design shall be qualified in the report by stating that there might be other sources with similar outsole/tread designs.
- 2.11.1.4. The reason for an inconclusive result shall be stated.
- 2.11.1.5. If an impression was searched in a database, this shall be stated.
- 2.11.1.6. If an item is not examined, this shall be stated.
- 2.11.1.7. If additional evidence (which could include but is not limited to hairs, fibers, and/or glass) is collected from the parent item by an analyst for a potential future examination and returned in the original packaging, this shall be stated in the report.
- 2.11.1.8. If an analyst creates a sub-item or new item that will be returned directly to the contributor without further examinations (i.e.

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footwear test impressions and/or lifts), this shall be stated in the report.

- 2.11.1.9. Supplemental reports generally do not contain the results from the original certificate of analysis, but should only address the results for the item(s) of evidence or impressions that were needed for the additional examination.
- 2.11.2. Examples: The following are some report wording examples. There may be situations that do not fit the examples given. Unique wording for these situations will be developed as the need arises.
 - 2.11.2.1. Use for Observed Footwear/Tire Impressions
 - 2.11.2.1.1. _____ (Number) footwear/tire impressions suitable for comparison were observed on _____ (Item #). The impressions were preserved through digital imaging.
 - 2.11.2.1.2. _____ (Number) footwear/tire impressions sufficient for comparison were observed on item _____ and preserved through digital imaging.
 - 2.11.2.2. Use for Developed Footwear/Tire Impressions
 - 2.11.2.2.1. _____ (Number) footwear/tire impressions suitable for comparison were developed on _____ (Item #). The impressions were preserved through digital imaging.
 - 2.11.2.2.2. _____ (Number) footwear/tire impressions sufficient for comparison were developed on item _____ and preserved through digital imaging.
 - 2.11.2.3. Use for Comparison
 - 2.11.2.3.1. The _____ (Number) footwear/tire impressions were compared to the shoes/tires, and to the test impressions made from the shoes/tires in item _____.
 - 2.11.2.3.2. The _____ (Number) footwear/tire impressions were compared to the test impressions of the shoes/tires (Item #).
 - 2.11.2.4. Use for Database Entry
 - 2.11.2.4.1. The _____ (Number) footwear/tire impressions were searched in the Shoeprint Image Capture and Retrieval (SICAR) database.
 - 2.11.2.5. Use for Impression not suitable for Database Entry
 - 2.11.2.5.1. The _____ (Number) footwear/tire impressions lack a definite footwear shape and tread design; therefore, they are not suitable for entry into the Shoeprint Image Capture and Retrieval (SICAR) database.
 - 2.11.2.6. Use for Database Hit/Candidate
 - 2.11.2.6.1. As a result of the SICAR entry, it was found that the _____ (Number) impressions are consistent with having been made by the tread design that is depicted on the outsole of a _____ (Make and

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Model). If shoes with a tread design resembling that of the outsole of a _____ (Make and Model) are collected, please submit them to the laboratory for further analysis.

- 2.11.2.7. Use for No Suitable Impressions Observed/Developed
 - 2.11.2.7.1. No footwear/tire impressions suitable for comparison were observed/developed on _____ (Item #).
- 2.11.2.8. Use for Identification
 - 2.11.2.8.1. The footwear/tire impression in the _____ (Item #) was in agreement in size, shape, tread design, and individualizing characteristics with the left/right shoe/tire in item ____; therefore, the impression was identified as having been made by the left/right shoe/tire in item ____.
- 2.11.2.9. Use for Exclusion
 - 2.11.2.9.1. The footwear/tire impression in the _____ (Item #) disagreed in tread design with the shoes/tires in item ____; therefore, the impression was excluded as having been made the shoes/tires in item ____.
 - 2.11.2.9.2. The footwear impression in the _____ (Item #) was in agreement in tread design with the shoes in item ____; however, the impression disagreed with the tread alignment of the left/right shoe in item ____.
Therefore, the impression was excluded as having been made by the left/right shoe ____.
- 2.11.2.10. Use for Could Have with *Limited* Identifying Characteristics
 - 2.11.2.10.1. The footwear/tire impression in the _____ (Item #) was in agreement in size, shape, tread design, and limited identifying characteristics with the right/left shoe/tire in item ____; therefore, the impression could have been made by the right/left shoe/tire in item ____.
- 2.11.2.11. Use for Could Have with *only* Class Characteristics
 - 2.11.2.11.1. The footwear/tire impression in the _____ (Item #) was in agreement in size, shape, and tread design with the right/left shoe/tire in item _____. The impression lacked identifying characteristics, but the impression could have been made by the right/left shoe/tire in item ____ or any other shoe/tire with the same class characteristics.
- 2.11.2.12. Use for Could Have without a Scale
 - 2.11.2.12.1. The footwear/tire impression in the _____ (Item #) was in agreement in shape and tread design with the right/left shoe/tire in item ____; however, due to the lack of a scale in the photographs, the impression was unable to be sized.
- 2.11.2.13. Use for Could Have with Limited Impression Visible (only one or two elements)

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2.11.2.13.1. One additional impression was observed in _____ (Item #). The impression depicts a _____ shape (describe the impression); however, it lacks identifying characteristics. The tread design of the shoes/tires in item _____ contains _____ shapes; therefore, the impression could have been made by the shoes/tires in item _____ or any other object with that same shape.

2.11.2.14. Use for Possible Size Range

2.11.2.14.1. A possible size range of the footwear impression _____ (Item #) is a Men's U.S. size _____ to _____. This size range allows for any foot slippage or distortion due to scale placement.

2.12. References:

- 2.12.1. 2006 ASCLD/LAB-*International Supplemental Requirements*
- 2.12.2. BVDA America Inc. "Acid Yellow 7." 22 July 2009
http://usa.bvda.com/productinfo.php?file=acid_yellow_7
- 2.12.3. CBDIAL. "Latent Fingerprint Processing Techniques-Selection & Sequencing Guide." 18 June 2010 <http://www.cbdial.org/Reagents/main.html>
- 2.12.4. Coleman Vacu-print Manual by Lightning Powder Company, Inc.
- 2.12.5. Crimescope CS-16 Tunable Forensic Light Source Manual by SPEX Forensics
- 2.12.6. Deep Vacuum Pumps Manual by Fast Vac
- 2.12.7. Federal Bureau of Investigation. U.S. Dept. of Justice. *Processing Guide for Developing Latent Prints*. U.S. Government, 2000.
- 2.12.8. Hot Plate Manual by Barnstead International
- 2.12.9. ISO/IEC 17025:2005, ASCLD/LAB-International (American Society of Crime Laboratory Directors/Laboratory Accreditation Board)
- 2.12.10. Mideo Systems Inc, *Indiana State Police Reference Material*
- 2.12.11. Model 6105 Fingerprint Development Chamber Operation's Manual by Caron
- 2.12.12. Nikon Camera Manual(s) by Nikon
- 2.12.13. Reflected Ultra-Violet Imaging System (RUVIS) Manual by Horiba Jobin Yvon
- 2.12.14. SafeAire Fume Hood Manual by Fisher Hamilton
- 2.12.15. SafeFume Cyanoacrylate Automated Fuming Cabinet Manual by Air Science USA
- 2.12.16. Safety Manual, Indiana State Police Laboratory
- 2.12.17. Stirrers, Hotplates, and Stirring Hotplates Manual by Fisher Scientific
- 2.12.18. SWGTREAD Documents (Scientific Working Group for Shoeprint and Tire Tread Evidence) <http://www.swgtread.org/guidelines/published.html>
- 2.12.19. TracER Laser Manual by Coherent
- 2.12.20. Tread Design Guide
- 2.12.21. Ultraviolet Crosslinkers Manual by Ultra-Violet Products Ltd.

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3. Digital Image Processing Method:

3.1. Scope: This method defines the procedures and techniques that are routinely used to store digital images and to improve the quality of observed and developed latent print impressions, lifts, photographs, and digital images containing latent print impressions. The Indiana State Police Laboratory Latent Print Identification Unit utilizes Mideo Caseworks, Mideo Workspace, and Adobe Photoshop for the processing and storage of all latent print images used for comparison. This method is meant to be general in nature, as no two digital images will ever necessarily need the same digital imaging procedures performed on them.

3.2. Precautions/Limitations:

3.2.1. The intent of image enhancement is to make details of an image that are less visible more visible. Enhancement may be used to increase contrast between the print and the substrate, reverse the color of ridges, etc. Anything that weakens or casts doubt on the credibility of an image, which is part of a criminal or internal investigation, is forbidden.

3.2.2. The exact procedures for image enhancement are not listed in this method. The exact procedures shall be determined at the time of examination by the analyst to attempt to maximize detail.

3.3. Related Information:

3.3.1. [Latent Print Test Method 1: Friction Ridge Comparison Method](#)

3.3.2. [Latent Print Test Method 2: Footwear and Tire Track Comparison Method](#)

3.3.3. [Appendix 1 Mideo Caseworks/Workspace Documentation](#)

3.3.4. [Appendix 2 Technical and Administration Review Procedure for Latent Print Cases](#)

3.3.5. [Appendix 3 Technical and Administrative Review Procedure for Footwear and Tire Cases](#)

3.3.6. [Appendix 4 Example Worksheets](#)

3.3.7. [Appendix 5 Abbreviations](#)

3.3.8. [Appendix 6 ALS Filter and Goggle Recommendations](#)

3.3.9. [Appendix 7 Logs](#)

3.3.10. [Appendix 8 Processing Manual](#)

3.3.11. [Appendix 9 Instrumentation Calibration and Maintenance](#)

3.4. Instruments:

3.4.1. Digital Cameras

3.4.2. Scanners

3.4.3. Storage Media (e.g. thumb drive, CD/DVD+/-R, flash cards, etc.)

3.4.4. Output Media and Printers

3.4.5. Computer Monitors

3.4.6. Digital Imaging Computer Towers

3.4.7. Mideo Caseworks/Workspace

3.4.8. Adobe Photoshop

3.5. Reagents/Materials:

3.5.1. Printer Ink

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3.5.2. Printer Paper

3.6. Hazards/Safety:

3.6.1. Printer Ink: No adverse affects are expected under intended use. Refer to the Material Safety Data Sheet (MSDS) for more information.

3.7. Reference Materials/Controls/Calibration Checks:

3.7.1. Calibration checks for instruments and equipment are outlined in the Instrument Calibration and Maintenance Manual ([Appendix 9](#)).

3.7.1.1. [Digital Imaging Equipment](#)

3.7.1.2. [Digital Cameras](#)

3.7.1.3. [Scales](#)

3.8. Procedures/Instructions:

3.8.1. Images Submitted by Outside Agencies

3.8.1.1. Submitted images of latent prints should contain a scale.

3.8.1.2. It is preferred that images that are to be used for comparison purposes be submitted in a file format that uses lossless compression or no compression, such as RAW or TIFF, and that the images be at the maximum resolution possible.

3.8.1.2.1. Note: RAW plug-ins, provided by the camera manufacturer, may be needed to view images.

3.8.1.3. If a printed photograph is submitted, the analyst should request the original digital image or the negative of that image.

3.8.2. Images Captured by an Analyst During an Examination

3.8.2.1. Images that may be improved upon through digital imaging will be processed in digital imaging as part of the original examination request.

3.8.2.2. All images shall be captured in a file format that uses lossless compression or no compression, such as RAW or TIFF, and all images should contain a scale. If the scale is interfering with the photograph, another photograph can be taken without the scale as long as all settings remain the same.

3.8.2.3. Images of the unknown impression that are to be used for comparison purposes should be captured at a minimum resolution of 1,000 ppi.

3.8.2.4. Images of an exemplar that are to be used for comparison purposes shall be captured at a minimum resolution of 500 ppi.

3.8.2.5. Images scanned at 1:1 resolution do not need to include a scale.

3.8.3. Images can be processed using a variety of techniques and need only be processed to the point of quality where the analyst determines that:

3.8.3.1. An identification or exclusion is possible, or

3.8.3.2. The best possible quality of the image has been reached.

3.8.4. Image Processing Techniques

3.8.4.1. A wide variety of tools, imaging techniques, filters, and palettes are available in Mideo Workspace and Adobe Photoshop to aid the analyst in improving the evidentiary value of an image.

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Those that will best aid in the processing of an image shall be determined by the analyst at the time of the examination.

- 3.8.4.2. The Clone/Rubber Stamp tool in Adobe Photoshop shall not be used in the digital imaging process in any Indiana State Police Laboratory examination.
- 3.8.4.3. Tools, techniques, filters, or palettes an analyst has not been trained to use shall not be utilized without prior approval by a Unit Supervisor.

3.9. Records

3.9.1. Preservation of Images

- 3.9.1.1. Images captured by the analyst, which are sufficient quality for comparison, as well as lifts and photographs/digital images shall be uploaded to Mideo Caseworks prior to digital enhancement.
- 3.9.1.2. A legible copy shall be made of all known exemplars that will be used for comparison purposes by scanning them at a minimum resolution of 500 ppi. This copy shall then be uploaded into the Exemplar folder in Mideo Caseworks and retained as part of the laboratory case file.
- 3.9.1.3. All images that are digitally processed in Mideo Workspace or Adobe Photoshop (analysis plots of latent prints, charting of identifications, etc.) shall be saved in their respective folders in Mideo Caseworks.

3.9.2. Information Stored within Mideo Caseworks

- 3.9.2.1. Once an image is uploaded into Mideo Caseworks, Mideo Caseworks saves the original image and begins a history log of the image.
 - 3.9.2.1.1. Mideo Caseworks automatically authenticates the original images.
- 3.9.2.2. Once an image is uploaded into Mideo Caseworks, it is considered evidence and shall be maintained by the Indiana State Police Laboratory.
 - 3.9.2.2.1. All images in Mideo Caseworks are stored on a secure server, which can only be accessed through a password protected Indiana State Police Laboratory computer that has Mideo Caseworks installed. Each analyst has their own password to access the Laboratory network and a separate password to access Mideo Caseworks.
 - 3.9.2.2.2. The history log within Mideo Caseworks serves as a chain of custody by recording the name, date, and time when an image is accessed, and it records any changes made to that image.
 - 3.9.2.2.3. Mideo Caseworks maintains all original images. Any processing conducted on the image through Mideo Caseworks does not alter the original image.
 - 3.9.2.2.4. A thumbnail image contained in the Mideo Caseworks notes stored in LIMS-Plus JusticeTrax is

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indicative of an original image being stored in Mideo Caseworks.

3.10. Interpretations of Results:

3.10.1. Images need only be processed to the point of quality where the analyst determines that:

- 3.10.1.1. An identification or exclusion is possible, or
- 3.10.1.2. The best possible quality of the image has been reached.

3.11. Report Writing:

3.11.1. None

3.12. References:

- 3.12.1.** 2006 ASCLD/LAB-*International Supplemental Requirements*
- 3.12.2.** Blitzer, Herbert L., and Jack Jacobia. *Forensic Digital Imaging and Photography*. Academic Press, 2007
- 3.12.3.** ISO/IEC 17025:2005, ASCLD/LAB-International (American Society of Crime Laboratory Directors/Laboratory Accreditation Board)
- 3.12.4.** Mideo Systems Inc, *Indiana State Police Reference Material*
- 3.12.5.** SWGIT Documents (Scientific Working Group on Imaging Technology)
<http://www.theiai.org/guidelines/swgit/index.php>

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**APPENDIX 1 MIDEO
CASEWORKS/WORKSPACE
DOCUMENTATION**

Mideo Caseworks is a digital imaging management software program used for the storage and retrieval for all case images relating to latent print and footwear/tire cases, as well as for case documentation/notes for latent print cases.

1. Pulling a Case from LIMS-Plus JusticeTrax into Mideo Caseworks

- 1.1.** To start a case in Mideo Caseworks:
 - 1.1.1. Locate a case in LIMS-Plus JusticeTrax by using the double arrow icon or the locator under the File Menu.
 - 1.1.2. Enter the Case ID (the Laboratory Case Number).
 - 1.1.2.1. Selection Type shall be "Locate Case".
 - 1.1.3. A new case folder will be generated within Mideo Caseworks, and will appear in the file structure on the left side. Inside the Latent Print folder will be eleven folders that apply to the latent print unit.
 - 1.1.3.1. Evidence
 - 1.1.3.2. Overall
 - 1.1.3.3. Processing
 - 1.1.3.4. Location Photos
 - 1.1.3.5. Lifts
 - 1.1.3.6. Submitted Photos
 - 1.1.3.7. Latents
 - 1.1.3.8. Comparison Exemplars
 - 1.1.3.9. Additional Documentation
 - 1.1.3.10. Verification
 - 1.1.3.11. Review

2. General Mideo Instructions

- 2.1.** Within each folder there are fields to be completed.
 - 2.1.1. The "Name" is always required and cannot be repeated within the same folder.
 - 2.1.1.1. If in any folder the name shall be repeated, then add an "i" for image with a numerical value after the given "Name." For example, the "Name" might be "Item 001-gun-i2." The first image with the same file name does not need the suffix of "i," only the additional images. Start with "i2."
 - 2.1.2. The yellow fields are required and shall be filled out prior to saving.
 - 2.1.3. The white fields are not required, but may be used for recording additional information.
 - 2.1.3.1. If typing space becomes limited in the white fields, then a "Note" in the Additional Documentation folder should be used as a secondary source of documentation.

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- 2.2.** The use of numerical or alpha characters to indicate a lift or a latent shall be at the discretion of the analyst as long as the analyst is consistent throughout the case and labeling is clear to all reviewers. The addition of the laboratory item number in front of a latent character is also acceptable, as long as the latent identifier is not confused as a sub-item or a new item from an item of evidence.
- 2.3.** PDF file format may be used for general documentation of evidence, but is not recognized by Mideo in the case notes.
 - 2.3.1.** All PDF files within Mideo, with the exception of "TCR NOTES" which do not indicate changes or "REVIEWED NOTES," shall be uploaded into LIMS-Plus JusticeTrax.
- 2.4.** Within Mideo, submitted photographs (digital images or printed), shall follow the same workflow process.
- 2.5.** File Size and Format
 - 2.5.1.** Files uploaded into Mideo that will be viewed within Mideo Workspace shall not exceed 8k x 8k in pixel dimensions.
 - 2.5.2.** If an image is larger than 8k x 8k pixel dimension, then crop the image to only include the area of interest or view within Adobe Photoshop.
 - 2.5.3.** Mideo software does not support 16 bit grayscale and thus, shall not be used.
 - 2.5.4.** All RAW images shall be converted to TIFF format using the Mideo plug-in.
- 3. Evidence Folder**
 - 3.1.** The Evidence folder is used to record the packaging and item description information for each item, including exemplars. All items of evidence shall be represented in the Evidence folder.
 - 3.2.** To start documentation for an item of evidence:
 - 3.2.1.** Right click on the white space and either Import an overall picture of the item, or select the New Evidence Icon.
 - 3.2.2.** Basic Information:
 - 3.2.2.1.** The "Lab Item #" field shall be the laboratory item number (i.e. Item 001 or 001).
 - 3.2.2.2.** The "Description" and "Notes" fields should be used to add a more detailed description of the items if the photograph does not contain all their pertinent information.
 - 3.2.3.** Custom Information:
 - 3.2.3.1.** The "Evidence Type" field shall be chosen according to the item of evidence (Lift Card, Evidence Item, Submitted Photographs, or Exemplar)
 - 3.2.3.1.1.** The additional fields relating to the individual item types shall be completed appropriately.
- 4. Overall Folder**
 - 4.1.** The Overall folder is used to store additional photographs of an item of evidence that are not attached to the Evidence data. General photographs of evidence, which include the item and/or its packaging, should be stored in the Overall folder. For example, if the item of evidence is a gun, then the overall photo will be attached to the Evidence data, but additional photographs of the serial number, make, and model of the gun shall be stored in the Overall folder.
 - 4.2.** Basic Information:

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- 4.2.1. The "Lab Item #" field shall be the laboratory item number (i.e. Item 001 or 001). If there is no laboratory item number associated to the images, then "Name" the file with a general descriptor.
 - 4.2.2. The "Description" and "Notes" fields are not required but may include additional descriptors for the photograph. For example, "serial number", "make and model", "close-up", etc.
- 4.3. Custom Information:
 - 4.3.1. The "Type" field can be used to indicate what is represented in the photograph (Outside packaging, Item of evidence, Lifts, Exemplars, or Other).
 - 4.3.2. The "Additional Notes" field is not required but may include additional descriptors for the photograph.
- 5. **Processing Folder**
 - 5.1. The Processing folder is used to document any physical and chemical processing conducted on an item.
 - 5.1.1. In most cases, exemplars and/or lifts should not be represented in the Processing folder.
 - 5.2. To start documentation of an item of evidence:
 - 5.2.1. Right click on the white space and either select New then Evidence or select Import then choose an overall picture of the item.
 - 5.2.1.1. Because each item has already been represented in the Evidence folder, photographs representing the items may not be necessary in the Processing folder.
 - 5.2.1.2. If an item contains multiple pieces of evidence and the pieces will be processed differently, each piece should be entered as a separate Evidence Icon. For example, if Item 1 contains a gun and four cartridges, two Evidence Icons should be created. One icon may be named "Item 1-gun" and the other may be named "Item 1-four cartridges".
 - 5.2.2. Basic Information:
 - 5.2.2.1. The "Lab Item #" field shall be the laboratory item number (i.e. Item 001 or 001). If there is no laboratory item number associated to the image, then the "Lab Item #" should be replaced with a general descriptor.
 - 5.2.2.2. The "Description" and "Notes" fields are not required but may include additional descriptors for the item.
 - 5.2.3. Custom Information:
 - 5.2.3.1. Visual Exam
 - 5.2.3.1.1. Complete fields appropriately.
 - 5.2.3.2. Evidence Processing
 - 5.2.3.2.1. Choose the appropriate processing method for the item of evidence, and then complete the fields accordingly.
 - 5.2.3.2.1.1. If additional or non-specified processing techniques are utilized, choose "Other" and then complete the fields accordingly.
- 6. **Location Folder**
 - 6.1. The Location folder is used to document where any developed latent prints are located on the item of evidence, if photographs are taken.

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6.2. Naming:

6.2.1. The "Lab Item #" shall be the laboratory item number.

6.2.2. The location of the latent prints shall be indicated in the image by the use of a text box, a marker, or by the placement of a scale.

6.2.2.1. Each latent print shall have a unique identifier that will ultimately become its "Unique Latent ID" in the Latents Folder.

7. Lifts Folder

7.1. The Lift folder is used to document the existence of lift cards, gel lifters, and/or Mikrosil lifts.

7.2. Each lift shall be scanned as a TIFF or CPWS file and uploaded in this folder, even if they do not contain any latent prints of value.

7.2.1. Lifts of no value from one item and/or multiple items may be grouped together and scanned as one file.

7.3. Basic Information:

7.3.1. The "Unique Lift ID" should include at minimum the unique identifier of lift(s).

7.3.2. The "Description" and "Notes" fields are not required but may include additional descriptors for the item.

7.4. Custom Information:

7.4.1. The "LOV present" field shall be marked appropriately, and the relating fields shall be completed accordingly.

8. Submitted Photographs Folder

8.1. The Submitted Photographs folder shall contain the digital images and/or printed photographs submitted for examination.

8.1.1. Duplicate digital images and/or printed photographs, along with general crime scene photographs, shall be uploaded to the Non-Casework Images folder if the image is not represented in the Submitted Photographs folder.

8.2. Basic Information:

8.2.1. The "Unique Photo ID" field should at minimum contain image file number for digital images (i.e. DSC_1234) or the given unique identifier for printed photographs.

8.2.2. The "Description" and "Notes" fields are not required, but may include additional descriptors for the item, such as the laboratory item number.

8.3. Custom Information:

8.3.1. The "Photograph Type" field should be chosen, and then the additional fields completed accordingly.

9. Latents Folder

9.1. The Latents folder is used to store all the latent prints of value for comparison including the plotted images; however, any latent print can be stored in this folder regardless of its value.

9.1.1. Each latent print in this folder shall have its own file in order to have its own data for analysis, comparison, and AFIS.

9.1.1.1. If a developed latent print is duplicated through processing and is uploaded into the Latents folder, then under the Analysis tab the result shall indicate it is a duplicate to another latent print that will have comparison results.

9.2. Basic Information:

9.2.1. The "Unique Latent ID" field shall indicate the unique identifier of the latent print. For example, "Latent A", "Lift 1- Latent A", or "001A".

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9.2.1.1. The "Description" and "Notes" fields are not required, but may include additional descriptors for the latent print.

9.3. Custom Information:

9.3.1. Basic Information

9.3.1.1. Complete fields appropriately.

9.3.2. Analysis Information

9.3.2.1. Complete fields appropriately.

9.3.3. Comparison Information

9.3.3.1. Complete fields appropriately.

9.3.4. AFIS Analysis

9.3.4.1. Complete fields appropriately.

9.3.4.2. If a latent print is identified or deemed not of value, AFIS analysis does not need to be completed.

9.4. File Size and Format

9.4.1. Photographed and scanned latent prints should be imported at a minimum of 1000ppi in TIFF or RAW format.

10. Comparison Exemplars folder

10.1. The Comparison Exemplars folder is used to store comparison exemplars.

10.1.1. If latent prints of value are developed/observed, all individuals with exemplars shall be represented in this folder for comparison information purposes.

10.1.1.1. If no comparisons are made to an exemplar, then a generic icon may be used in the Comparison Exemplars folder.

10.1.1.2. If multiple pages (i.e. major case prints, palm print cards, etc.) and/or ten print cards are included in one item, the pages and/or cards used for comparison shall be separated and have their own file with data.

10.1.1.2.1. The additional pages and/or cards not used for comparison may be stored in the Additional Documentation folder as a PDF file scanned at a resolution of minimum resolution of 600 ppi. A comment should be made stating this location.

10.1.2. Exemplars shall be scanned in between 500-1000 ppi. If a higher resolution image is needed, then the area of interest shall be selected and scanned separately.

10.1.2.1. Basic Information:

10.1.2.1.1. The "Subject Name/Area" field shall be at minimum the name on the exemplar.

10.1.2.1.1.1. If there is no name present on the exemplar, the "Subject Name/Area" field may be referred to as the laboratory item number (i.e. post mortem prints).

10.1.2.1.1.2. If there are multiple copies of a exemplar from the same person that are to be used for comparison, then the "Subject Name/Area" field shall include the letter "i" for image and a numerical value after the name as outlined above. For example "Bill Smith-i2."

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10.1.2.1.1.3. If you crop an area of interest and scan a particular area or finger at a higher resolution, then the "Subject Name/Area" field shall also include what area was cropped. For example, "Bill Smith-right thumb-rolled."

10.1.2.1.2. The "Description" and "Notes" fields are not required, but may include additional descriptors for the item, such as the laboratory item number.

10.1.2.2. Custom Information

10.1.2.2.1. The "Subject Name" field shall be the name on the exemplar. The "Subject Name" field is where Mideo Caseworks accesses the exemplar information for the comparison to the latent print. Multiple exemplars from the same individual shall have the same "Subject Name."

10.1.2.2.2. Complete all other fields appropriately.

11. Additional Documentation Folder

11.1. The Additional Documentation folder enables an analyst to make additional case notes within the case file.

11.2. The Additional Documentation folder is where the analyst shall store any PDF files and/or scans, emails, prepared charts, and/or administrative documents (i.e. Request for Laboratory Examination Form [629]).

11.2.1. Additional Case Notes:

11.2.1.1. Basic Information

11.2.1.1.1. The "Documentation Type" field shall be the subject or reason for the note. For example, "Combined DNA/LP notes," "officer communication," or "court chart."

11.2.1.1.2. Several "note" files may be created in one case.

12. Verification Folder

12.1. The Verification folder is used to record verification data on images that are identified or excluded.

12.2. The case analyst is responsible for placing a copy of their identified or excluded latent prints into the verification folder and sending a notification to the reviewer regarding the case status.

12.2.1. The case analyst may place an unplotted chart into this folder instead of just the latent print.

12.2.2. Basic Information:

12.2.2.1. The case analyst shall keep the "Name" and "Title" fields of these images the same as the original files.

12.2.2.2. In the description field, the case analyst shall add the name of the individual identified or excluded. For an identification, the area of friction ridge skin from a particular finger or palm shall also be indicated.

12.2.3. The verifier is responsible for copying/transferring the exemplars into the review folder in order to conduct the comparison.

12.2.4. The verifier shall complete the data in the required fields and notify the case analyst that the verification has been completed.

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12.2.5. Verification shall occur before a case is considered completed.

13. Review Folder

13.1. Technical Review

13.1.1. The Review folder is used to conduct technical reviews of a case and allows update access to all latent print analysts, unlike the other folders which are restricted to only the case analyst.

13.1.2. Once a case is completed, the case analyst shall generate a full detailed case report in PDF format by right clicking on the main Latent Prints folder and choosing "Print Summary."

13.1.2.1. Choose either the ISP Case Notes or the Truncated ISP Case Notes.

13.1.2.2. Choose "Print Directly to PDF" and "Save to the Database".

13.1.2.3. Name file as "TCR NOTES" version one using the LIMS-Plus JusticeTrax naming convention outlined in Gen. Policy 37.

13.1.3. The notified reviewer is responsible for copying and/or transferring the necessary files into the Review Images folder for technical review.

13.1.4. The reviewer shall review the generated case notes report and other applicable images to conduct a full technical review.

13.1.5. The reviewer may make comments for suggested or required changes on the original "TCR NOTES" in the main Latent Prints folder by using Adobe Reader.

13.1.5.1. To be able to make comments for suggested and/or required changes, the reviewer must right click on the generated case notes report, choose Tools, Check File Out, then select destination and choose Accept. The file will then need to be opened from the selected destination to be able to be viewed for review.

13.1.5.2. The case analyst may delete the technical reviewer's comments from the "TCR NOTES" once the technical review is complete.

13.1.6. If during the review process there are several versions of case notes created due to required and/or suggested changes, these interim notes should be named "REVIEWED NOTES" with the appropriate version number.

13.1.6.1. "REVIEWED NOTES" shall be saved in the main Latent Prints folder and will not be uploaded into LIMS-Plus JusticeTrax.

13.1.6.2. To indicate changes from the original case notes report to the finalized report, the case analyst may create a cover sheet in Microsoft Word and import the file into the main Latent Prints folder within Mideo Caseworks. As another option, the analyst may use Adobe Reader on their original "TCR NOTES" to make their own comments and/or highlight the changes that were made. (To be able to make comments for changes made, the case analyst must right click on the TCR NOTES, choose Tools, Check File Out, then select destination and choose Accept. The file will then need to be opened from the selected destination to be able to make comments.)

13.1.6.3. All changes from the original "TCR NOTES" to the "FINAL NOTES" shall be tracked and saved in LIMS-Plus JusticeTrax.

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- 13.1.6.4. If there are no changes from the original "TCR NOTES" to the finalized case notes report, then only the "FINAL NOTES" shall be uploaded into LIMS-Plus JusticeTrax.
- 13.1.7. Once the case has met all the requirements, the reviewer shall fill out the required fields under the Technical Case Review icon.
 - 13.1.7.1. The reviewer shall then notify the case analyst to create and upload their final version of case notes in the main Latent Prints folder.
 - 13.1.7.2. The original analyst shall then ensure that the contents of the the Review Images folder have been deleted and then create a final case notes report named "FINAL NOTES" with the appropriate naming convention as outlined in Gen. Policy 37 that will be uploaded into LIMS-Plus JusticeTrax.
 - 13.1.7.3. The reviewer shall mark the technical review milestone within LIMS-Plus JusticeTrax.
- 13.1.8. The technical case review icon with data shall remain in the Review folder.
- 13.1.9. All versions of case note reports, and if applicable, the cover sheet or file to indicate case note changes shall be stored in the main Latent Prints Folder.
- 13.1.10. **Administrative Review**
 - 13.1.10.1. The technical reviewer is also responsible for the preliminary administrative review within LIMS-Plus JusticeTrax prior to requesting an administrative review from a supervisor or one of their designees (See [Appendix 2](#)).

14. Footwear-Tire Folder

- 14.1. The Footwear-Tire folder is used to store digital images from footwear and tire cases.

15. Non-Casework Images Folder

- 15.1. Non-Casework Images, which may include general crime scene photographs from a submitted CD or DVD, shall be stored in the Non-Casework Images folder and shall not be printed on the case notes report.

16. Reporting Folder

- 16.1. The Reporting folder is used to enable the case analyst to use the table option for reporting.

17. Duplicates of Latent Prints

- 17.1. Duplicate lifts with the same latent print(s) shall be stored in the Lifts folder. Duplicate digital images and/or printed photographs with the same latent print(s) shall be stored in the Submitted Photographs folder. To vary the "Unique Lift/Photo ID," add an "i" with a numerical value as described in the General Mideo Instructions.
- 17.2. Only the best quality image of a duplicated latent print from a lift and/or submitted photo needs to be stored in the Latents folder.

18. Creation of Sub-Items and New Items

- 18.1. Created sub-items or new items that will require an examination within the Latent Print Identification Unit, such as lifts, shall be treated as an item of evidence, and it shall be recorded as a separate file in the Evidence Folder and will follow the outlined Mideo Caseworks workflow.
- 18.2. Created sub-items or new items for examination in other forensic disciplines shall be recorded in an appropriate comment for additional information fields or in the "Notes" section of the Additional Documentation Folder.

19. Additional Submissions

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19.1. Additional submissions will be documented using the “Milestones” Tool located in the 1. Latent Prints folder.

19.2. Place an additional technical review icon in the Review folder for each subsequent request.

20. Case Withdraws

20.1. If a case has already been started in Mideo Caseworks and a withdraw request is received, then a “note” indicating the withdraw shall be made in the Additional Documentation folder.

20.2. A case notes report named “WITHDRAW NOTES” with the appropriate naming convention as outlined in Gen. Policy 37 shall be generated and uploaded into LIMS-Plus JusticeTrax.

20.3. A withdrawn case that does not report results on the Certificate of Analysis does not need a technical review.

21. Deletion of Mideo Files

21.1. On the rare occasion that a Mideo file in the Latents, Verification or Review folders needs to be deleted, the file should be renamed to “Delete” and then a Mideo Administrator shall be contacted.

21.2. If a Mideo file has been uploaded to LIMS-Plus JusticeTrax and needs deleted, then send an email request to the LIMS administrator.

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**APPENDIX 2 TECHNICAL AND
ADMINISTRATIVE REVIEW PROCEDURE
FOR LATENT PRINT CASES**

To ensure the highest quality of work, all case work generated in the Latent Print Identification Unit, with the exception of withdrawn examinations, shall be technically and administratively reviewed by another qualified latent print examiner before a Certificate of Analysis is released.

1. Qualified Technical and Administrative Reviewers

- 1.1. A qualified reviewer is one who has successfully passed the Indiana State Police Latent Print Training Program and has been released from supervised casework. In addition, a qualified reviewer has successfully completed technical and administrative review training.
- 1.2. Analysts shall not perform technical or administrative reviews on their own work.
- 1.3. Analysts shall perform a complete review of their own case file prior to submission for technical review.
- 1.4. Verifications shall be completed before the technical review process.
- 1.5. Minor deviations from this outlined technical and administrative review procedure may be approved by a Unit Supervisor and documented in the case file.

2. Technical Review Procedure for Latent Print Cases

- 2.1. The Review folder, located in Mideo Caseworks, shall be used to conduct technical reviews of a case.
- 2.2. Once a case is completed and all verifications are conducted, the case analyst shall generate a full detailed case notes report in PDF format and save the file as "TCR NOTES" version one case notes report to the main Latent Prints folder using the appropriate naming convention as outlined in Gen. Policy 37.
- 2.3. The reviewer is responsible for copying and/or transferring the necessary files into the Review Images folder, located in Mideo Caseworks.
- 2.4. The reviewer shall review the generated case notes report and other applicable images to conduct a full technical review.
 - 2.4.1. The reviewer may make comments for suggested or required changes on the original "TCR NOTES" in the main Latent Prints folder by using Adobe Reader.
 - 2.4.2. The case analyst may delete the technical reviewer's comments from the "TCR NOTES" once the technical review is complete.
- 2.5. If during the review process there are several versions of case notes created due to required and/or suggested changes, these interim notes should be named "REVIEWED NOTES" with an appropriate version number.
 - 2.5.1. REVIEWED NOTES shall be saved in the main Latent Prints folder and will not be uploaded into LIMS-Plus JusticeTrax.
- 2.6. To indicate changes from the original "TCR NOTES" report to the finalized case notes report, the case analyst may create a cover sheet in Microsoft Word and import the file into the main Latent Prints folder within Mideo Caseworks. As another

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option, the analyst may use Adobe Reader on their original "TCR NOTES" to make their own comments and/or highlight the changes that were made.

2.6.1. All changes from the original "TCR NOTES" to the "FINAL NOTES" shall be tracked and saved in LIMS-Plus JusticeTrax.

2.6.2. If there are no changes from the original "TCR NOTES" to the finalized case notes report, then only the "FINAL NOTES" shall be uploaded into LIMS-Plus JusticeTrax.

2.7. Once the case has met all the requirements, the reviewer shall fill out the required fields under the Technical Case Review icon and delete the images in the Review Images folder.

2.7.1. The reviewer shall then notify the case analyst to create and upload a final case notes report named "FINAL NOTES" using the appropriate naming convention as outlined in Gen. Policy 37 into LIMS-Plus JusticeTrax.

2.7.2. The reviewer shall mark the technical review milestone within LIMS-Plus JusticeTrax.

3. Administrative Review Procedure for Latent Print Cases

3.1. The technical reviewer is also responsible for conducting the preliminary administrative review of all the documentation.

3.2. At the completion of the case, the original analyst shall mark their Certificate of Analysis as Draft Complete in LIMS-Plus JusticeTrax before notifying their reviewer.

3.3. The reviewer shall look at the following criteria in an administrative review:

3.3.1. Check that all PDF's, with the exception of "TCR NOTES" which do not indicate changes or "REVIEWED NOTES," are uploaded in LIMS-Plus JusticeTrax using the appropriate naming convention as outlined in Gen. Policy 37.

3.3.2. Check that all documents are properly marked with name or initials and case number.

3.3.3. Verify the Request for Laboratory Examination (629), if available, is uploaded in LIMS-Plus JusticeTrax.

3.3.4. Verify that the case notes are uploaded in LIMS-Plus JusticeTrax using the appropriate naming convention as outlined in Gen. Policy 37.

3.3.5. Verify proper indication for type of Certificate of Analysis (i.e. amended or supplemental).

3.3.6. Check that submitting agency information is correct by comparing information to the 629, if available, (agency case number, investigator, etc.) to the Certificate of Analysis.

3.3.7. Verify that the item descriptions are complete and accurate by comparing information to the 629, if available, and the analyst's notes.

3.3.8. Check that the analyst accurately stated the number of latent prints that were developed per item.

3.3.9. Check that the Certificate of Analysis addressed all items submitted and related sub-items or new items.

3.3.10. Check that all pertinent examination requests were addressed.

3.3.11. Check that a reason was stated for inconclusive results.

3.3.12. Evaluate the report for consistency, grammar, spelling, and other key components.

3.4. If the reviewer believes the Certificate of Analysis needs a correction, the reviewer shall "Reject Findings" in LIMS-Plus JusticeTrax. The reviewer shall note their

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findings in the “Notes” section in the “Reviewer” box under the appropriate examination request. These findings may be categorized as “S” for suggestions or “R” for requirements.

- 3.5.** Once the reviewer and the original analyst agree on any changes, the reviewer shall notify a unit supervisor or one of their designees to conduct the second part of the administrative review on the Certificate of Analysis, which includes reviewing the report for spelling and grammatical accuracy and compliance with report writing guidelines. The person conducting the administrative review shall check the Administrative Review milestone in LIMS-Plus JusticeTrax.

4. Resolution of Technical Variations and/or Conflicts of Opinion

- 4.1.** Handling of non-substantive technical variations and/or conflicts of opinion between the analyst and reviewer shall be addressed by a unit supervisor.
- 4.2.** Handling of substantive technical variations and/or conflicts of opinion between the analyst and reviewer shall follow the procedure in the Indiana State Police Laboratory Quality Assurance Manual.

5. Rotation for Technical and Preliminary Administrative Reviews

- 5.1.** Case reviews may be rotated amongst qualified analysts according to a rotation list provided by the Unit Supervisors.
- 5.1.1.** Rush cases, large cases, and related cases may be exempted from the rotation list.
- 5.1.2.** If an analyst on the rotation list is not available, then continue to the next available reviewer. It is not necessary to return to the skipped reviewer on the next case.
- 5.1.3.** If there are additional submissions to a case, it is recommended that the original reviewer conducts the reviews for the subsequent submissions.
- 5.1.4.** It is also acceptable, on occasion, to have a verifier that is not the technical reviewer.

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**APPENDIX 3 TECHNICAL AND
ADMINISTRATIVE REVIEW PROCEDURE
FOR FOOTWEAR/TIRE CASES**

To ensure the highest quality of work, all case work generated in the Latent Print Identification Unit, with the exception of withdrawn examinations, shall be technically and administratively reviewed by another qualified examiner before a Certificate of Analysis is released.

1. Qualified Technical and Administrative Reviewers

- 1.1. A qualified reviewer is one who has successfully passed the Indiana State Police Footwear/Tire Training Program and has been released from supervised casework. In addition, a qualified reviewer has successfully completed technical and administrative review training.
- 1.2. Analysts shall not perform technical or administrative reviews on their own work.
- 1.3. Analysts shall perform a complete review of their own case file prior to submission for technical review.
- 1.4. Verifications shall be completed before the technical and administrative review process.
- 1.5. Minor deviation from this outlined technical and administrative review procedure shall be approved by a Unit Supervisor and documented in the case file.

2. Technical and Administrative Review Procedure for Footwear/Tire Case Notes

Once a case is completed, the analyst's original notes shall be name TCR NOTES version one using the appropriate naming convention as outlined in Gen. Policy 37 and the original Microsoft® Word® case notes should be emailed to the reviewer.

- 2.1. The reviewer shall complete the appropriate Case Review Checklist for footwear/tire cases (see [Appendix 4](#)).
- 2.2. If no changes are needed, then the reviewer shall check the "no changes required" box on the Case Review Checklist.
- 2.3. If the reviewer believes there should be changes, the reviewer can make comments on the original analyst's Microsoft Word case notes. Comments can be made through a comment balloon in Microsoft Word. Comment balloons may be categorized as "S" for suggestions or "R" for requirements. Comments about the case can also be communicated verbally.
- 2.4. This Microsoft Word document with the reviewer's comments should be emailed back to the original analyst. The original analyst shall make all the "required" changes to a subsequent version of their case notes. The "suggested" changes should be considered, but are not mandatory changes.
- 2.5. The original analyst shall email the updated case notes back to the reviewer with the changes.
- 2.6. The reviewer shall review the updated case notes to ensure all required changes were made and write in the date of when the requirements were addressed on the Case Review Checklist.

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- 2.7.** The reviewer shall then notify the case analyst to create FINAL NOTES using the appropriate naming convention as outlined in Gen. Policy 37 that will be uploaded in LIMS-Plus JusticeTrax.

2.7.1. To indicate changes in the original case notes report to the finalized report, the case analyst may create a cover sheet in Microsoft Word. As another option, the case analyst may use highlighting or comment balloons in Microsoft Word to track changes.

2.7.1.1. All changes from the original "TCR NOTES" to the "FINAL NOTES" shall be tracked and saved in LIMS-Plus JusticeTrax.

2.7.1.2. If there are no changes from the original "TCR NOTES" to the finalized case notes report, then only the "FINAL NOTES" shall be uploaded into LIMS-Plus JusticeTrax.

3. Administrative Review Procedure for Certificate of Analysis

- 3.1.** The technical reviewer is also responsible for conducting the preliminary administrative review of all the documentation.
- 3.2.** At the completion of the case, the original analyst shall mark their report as Draft Complete in LIMS-Plus JusticeTrax before notifying their reviewer.
- 3.3.** The reviewer shall evaluate the report for consistency, grammar, spelling, and other key components.
- 3.4.** If the reviewer believes the report needs a correction, the reviewer shall "Reject Findings" in LIMS-Plus JusticeTrax. The reviewer shall note their findings in the "Notes" section in the "Reviewer" box under the appropriate exam request. These findings may be categorized as "S" for suggestions or "R" for requirements.

4. Resolution of Technical Variations and/or Conflicts of Opinion

- 4.1.** Handling of non-substantive technical variations and/or conflicts of opinion between the analyst and reviewer shall be addressed by a unit supervisor.
- 4.2.** Handling of substantive technical variations and/or conflicts of opinion between the analyst and reviewer shall follow the procedure in the Indiana State Police Laboratory Quality Assurance Manual.

5. Saving Technical and Administrative Files in LIMS-Plus JusticeTrax

- 5.1.** Once the review of the case notes and report is completed and has been discussed between the analyst and the reviewer, the reviewer shall upload the completed Case Review Checklist as a PDF file into LIMS-Plus JusticeTrax using the appropriate naming convention as outlined in Gen. Policy 37.
- 5.1.1.** Note: The Case Review Checklist does not change after the original examiner corrects any issues. The checklist is for the initial evaluation of the case. The reviewer only adds the date that the requirements were addressed to the Case Review Checklist.
- 5.2.** Once the reviewer and the original analyst agree on any changes, the reviewer shall notify a unit supervisor or one of their designees to conduct the second part of the administrative review on the Certificate of Analysis, which includes reviewing the report for spelling and grammatical accuracy and compliance with report writing guidelines. The person conducting the administrative review shall check the Administrative Review milestone in LIMS-Plus JusticeTrax.

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6. Rotation for Technical and Preliminary Administrative Reviews

- 6.1.** Case reviews may be rotated amongst qualified analysts according to a rotation list provided by the Unit Supervisors.
 - 6.1.1.** Rush cases, large cases, and related cases may be exempted from the rotation list.
 - 6.1.2.** If an analyst on the rotation list is not available, then continue to the next available reviewer. It is not necessary to return to the skipped reviewer on the next case.
 - 6.1.3.** If there are additional submissions to a case, it is recommended that the original reviewer conducts the reviews for the subsequent submissions.
 - 6.1.4.** It is also acceptable, on occasion, to have a verifier that is not the technical reviewer.

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APPENDIX 4 WORKSHEETS

1. Laboratory worksheets serve several purposes, including:
 - a. Documenting the work conducted by the analyst
 - b. Aiding in guiding the examination
 - c. Serving as an archive for future reference
2. Documentation shall be to the extent that another qualified analyst would be able to determine each examination activity conducted, their sequence, results of the activities, and any conclusions reached. Worksheets can be used in conjunction with digital notes to assist the examiner in recording this information.
3. The following are example worksheets, which are optional and may be used at the examiner's discretion.
 - a. [Examination Worksheet](#)
 - b. [Analysis Worksheet](#)
 - c. [Footwear/Tire Technical Case Review Checklist](#)

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APPENDIX 5 ABBREVIATIONS

Abbreviations may be used to streamline and speed-up the note taking process. This list of abbreviations is commonly used within the Unit. Other abbreviations may be used as long as they are explained in the footer of the case notes.

| Abbreviation | Associated Term |
|---------------------|--------------------------------------------------------|
| √ + | Positive Reagent Control |
| AB | Amido Black |
| ACE-V | Analysis, Comparison, Evaluation, and Verification |
| AFIS | Automated Fingerprint Identification System |
| ALS | Alternate Light Source |
| ARD | Ardrox |
| AY7 | Acid Yellow 7 |
| CA | Cyanoacrylate / Cyanoacrylate Ester |
| CB | Coomassie Blue |
| DFO | 1, 8-Diazafluoren-9-one |
| DNA | Deoxyribonucleic acid |
| DOB | Date of Birth |
| Elim | Elimination/Exclusion |
| ERL | Evansville Regional Laboratory |
| FBI | Federal Bureau of Investigation |
| FR | Friction Ridge |
| FS | Forensic Scientist |
| FWRL | Fort Wayne Regional Laboratory |
| GB | Gun Blueing |
| GV | Gentian Violet |
| GYRO | Green, Yellow, Red, and Orange color coding system |
| HCL | Hydrochloric Acid Fuming-AKA as Chemical Fuming |
| IAFIS | Integrated Automated Fingerprint Identification System |
| ID | Identification |
| Insuf Qual Quant | Insufficient quality and quantity |
| IRL | Indianapolis Regional Laboratory |
| ISP | Indiana State Police |
| ISPRD | Indiana State Police Records Division |
| LASER | Light Amplification by Stimulated Emission Radiation |
| LCV | Leucocrystal Violet |
| LIMS | Laboratory Information Management System |
| LOV | Latent of Value |
| LRL | Lowell Regional Laboratory |
| MFI | Marked for identification |

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| | |
|-------|--------------------------------------------|
| MPOW | Magnetic Powder |
| NIN | Ninhydrin |
| NM | Nanometer |
| OK | Positive control test performed |
| ORO | Oil Red O |
| PD | Physical Developer |
| PMFI | Previously marked for identification |
| POW | Black or Bichromatic Powder |
| RAY | Rhodamine 6, Ardrex P133D, Basic Yellow 40 |
| RUVIS | Reflective Ultra-Violet Imaging System |
| SICAR | Shoeprint Image Capture and Retrieval |
| SID | State Identification Number |
| SPR | Small Particle Reagent |
| SSN | Social Security Number |
| SSP | Sticky Side Powder |
| TCN | Transaction Control Number |
| TLI | Tenprint to Latent Inquiry |

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**APPENDIX 6 ALTERNATE LIGHT SOURCE
FILTER AND GOGGLE
RECOMMENDATIONS**

These are general recommendations and other combinations may result in better contrast especially at the extreme ends of each range where the chart shows overlap (i.e., for 540 nm both Orange and Red filters/goggles are recommended). In addition, other combinations, including not using filters, may provide better contrast when dealing with background fluorescence. An analyst's discretion should be used in determining the best combination.

| Wavelength of ALS | Recommended Filter and/or Goggles |
|-------------------|-----------------------------------|
| < 400nm | Yellow or UV safe |
| 400nm – 450nm | Yellow |
| 450nm – 540nm | Orange |
| 540nm – 700nm | Red |
| 700nm – 1100nm | Red or IR |

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APPENDIX 7 LOGS

The following logs are the suggested format for maintaining the necessary information. Variations of the format, not the required information, may be used with approval from the Unit Supervisor or their designee.

1. [AFIS Entry Log](#)
2. [AFIS Performance Test Log](#)
3. [Balance Calibration Check Log](#)
4. [Chemical Traceability Log](#)
5. [Eye Wash Log](#)
6. [Filter Log](#)
7. [Maintenance Log](#)
8. [Verification Log](#)

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APPENDIX 8 PROCESSING GUIDE

1. Introduction:

A latent print results from the reproduction of friction ridges found on parts of the fingers, hands, and feet. These prints consist of a combination of different chemicals that originate from natural secretions, blood, and contaminants. Natural secretions mainly derive from the eccrine and sebaceous glands and contain known chemical components. Eccrine gland secretions from the fingers, hands, and feet are both organic and inorganic; whereas, only organic materials are secreted from the sebaceous glands. Other contaminants found in latent prints result from contact with different materials in the environment. Understanding these characteristics will aid in processing an item for latent prints.

2. Surface Properties and Sequencing of Latent Print Processing

There are two basic surfaces or substrate types upon which latent print residue may reside, porous and nonporous. Analysts should adhere to the correct processing technique and sequence in which it is used for that surface type being examined. This affords the best opportunity to maximize development of friction ridge detail that may be present on a given surface. Depending upon the circumstances, not all of the suggested processes will always be employed. The case analyst based upon their knowledge, experience, and training, shall evaluate each surface and exercise their discretion as to the process(es) to be employed. The following are recommended sequences and processes for porous, nonporous, and some unique surfaces analysts may encounter; however, the analyst is not limited to these processes. Alternate procedures shall be approved by a Unit Supervisor prior to use in casework. Although not listed, visual examinations are always conducted after each step of any process.

2.1. Porous Surfaces

- 2.1.1.** Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting
- 2.1.2.** DFO (1,8-Diazafluoren-9-one)
- 2.1.3.** Laser or Alternate Light Source
- 2.1.4.** Ninhydrin
- 2.1.5.** Oil Red O or Physical Developer

2.2. Thermal Paper

- 2.2.1.** Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting
- 2.2.2.** HCl Fuming
- 2.2.3.** Oil Red O or Physical Developer

2.3. Nonporous Surfaces

- 2.3.1.** Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting
- 2.3.2.** Cyanoacrylate Fuming
- 2.3.3.** Cyanoacrylate Dye Staining
- 2.3.4.** Laser or Alternate Light Source

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- 2.3.5. Powder (Note: Powder may be used prior to Cyanoacrylate Dye Staining as the analyst deems appropriate)
- 2.4. **Bloodstained Items – Porous Surface**
 - 2.4.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting
 - 2.4.2. D.F.O. (1,8-Diazafluoren-9-one)
 - 2.4.3. Laser or Alternate Light Source
 - 2.4.4. Ninhydrin
 - 2.4.5. Oil Red O or Physical Developer
- 2.5. **Bloodstained Items – Nonporous Light-colored Surface**
 - 2.5.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting
 - 2.5.2. Leucocrystal Violet (LCV) or Amido Black
 - 2.5.3. Cyanoacrylate Fuming
 - 2.5.4. Cyanoacrylate Dye Staining
 - 2.5.5. Laser or Alternate Light Source
 - 2.5.6. Powder
- 2.6. **Bloodstained Items – Nonporous Dark-colored Surface**
 - 2.6.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting
 - 2.6.2. Cyanoacrylate Fuming
 - 2.6.3. Acid Yellow 7
 - 2.6.4. Alternate Light Source
 - 2.6.5. Cyanoacrylate Dye Staining
 - 2.6.6. Laser or Alternate Light Source
 - 2.6.7. Powder
- 2.7. **Cardboard**
 - 2.7.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting
 - 2.7.2. D.F.O. (1,8-Diazafluoren-9-one)
 - 2.7.3. Laser or Alternate Light Source
 - 2.7.4. Ninhydrin
 - 2.7.5. Oil Red O or Physical Developer
- 2.8. **Rubber Gloves - Semi porous**
 - 2.8.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting
 - 2.8.2. Cyanoacrylate Fuming
 - 2.8.3. RUVIS
 - 2.8.4. Magnetic Powder
 - 2.8.5. Cyanoacrylate Dye Staining
 - 2.8.6. Laser or Alternate Light Source
- 2.9. **Tape – Non-adhesive Side (protect the Adhesive side of the tape if possible)**
 - 2.9.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting
 - 2.9.2. Cyanoacrylate Fuming
 - 2.9.3. Cyanoacrylate Dye Staining
 - 2.9.4. Laser or Alternate Light Source
 - 2.9.5. Powder

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2.10. Tape – Adhesive Side

2.10.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting

2.10.2. Gentian Violet

2.10.3. Alternate Light Source

2.10.4. Sticky-side Powder or Alternate Powder

2.11. Tape (if unable to protect the Adhesive side)

2.11.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting

2.11.2. Cyanoacrylate Fuming of Adhesive and Non-adhesive sides

2.11.2.1. NOTE: If areas of the tape were not exposed during fuming, the tape may be re-fumed after it has been separated.

2.11.3. Gentian Violet on Adhesive side

2.11.4. Laser or Alternate Light Source

2.11.5. Sticky Side Powder or Alternate Powder on Adhesive side

2.11.6. Cyanoacrylate Dye Staining of Adhesive and Non-adhesive sides

2.11.7. Laser or Alternate Light Source

2.11.8. Powder on Non-adhesive side

2.12. Wallpaper

2.12.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting

2.12.2. Ninhydrin

2.13. Photographs

2.13.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting

2.13.2. Cyanoacrylate Fuming

2.13.3. Magnetic Powder (emulsion side)

2.13.4. D.F.O (1,8-Diazafluoren-9-one)

2.13.5. Laser or Alternate Light Source

2.13.6. Ninhydrin

2.13.7. Cyanoacrylate Dye Staining (emulsion side)

2.13.8. Laser or Alternate Light Source

2.13.9. Oil Red O or Physical Developer

2.14.

2.15. Glossy Paper/Cardboard – Semi porous

2.15.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting

2.15.2. Cyanoacrylate Fuming

2.15.3. Magnetic Powder

2.15.4. D.F.O. (1,8-Diazafluoren-9-one)

2.15.5. Laser or Alternate Light Source

2.15.6. Ninhydrin

2.15.7. Cyanoacrylate Dye Staining

2.15.8. Laser or Alternate Light Source

2.15.9. Oil Red O or Physical Developer

2.16. Cartridge Casings

2.16.1. Visual Examination, which may include the use of the RUVIS, Alternate Light Source, Laser, and/or oblique lighting

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- 2.16.2. Cyanoacrylate Fuming
- 2.16.3. Cyanoacrylate Dye Staining
- 2.16.4. Laser or Alternate Light Source
- 2.16.5. Powder
- 2.16.6. Gun Blue (if a brass cartridge casing)

3. Validation of Chemical Reagents

The chemical reagents used by analysts in the Latent Print Unit on a recurring basis are described in detail in these laboratory test methods.

Many of these formulations/reagents can also be found in the *“Processing Guide for Developing Latent Prints”* 2000 Edition, printed by the Laboratory Division of the F.B.I. Additionally, these historic methods for latent print development have been continually validated by the use of knowns/controls throughout the period of their use. Any new or different chemical reagent or processing method that may be used by the Latent Print Analysts shall be tested and validated in accordance with the Indiana State Police Laboratory Quality Assurance Manual prior to use.

Once a reagent is prepared, the Latent Print Analyst shall test the solution to ensure the accuracy of the preparation and that the desired chemical or physical reaction is being obtained. The Analyst shall fill out the chemical traceability reagent log (see [Appendix 7](#)). The container shall be labeled with the identity of the reagent, the date prepared, and their initials in accordance with Indiana State Police Laboratory Quality Assurance Manual.

4. Light Based Methods

4.1. Alternate Light Source (ALS)

- 4.1.1. Scope: Alternate light sources (ALS) are portable, multi-waveband, and tunable light sources that are used to enhance or visualize potential items of evidence. Latent impressions may be composed of various substances such as blood, perspiration, chemicals or other organic substances that react differently to different wavelengths of light. When a luminescent deposit is excited with a particular wavelength of light, the deposit absorbs the light and re-emits it at a different wavelength. The short-lived light being re-emitted is termed fluorescence. There are several alternate light sources available to analysts that adequately meet the needs described in this manual.
- 4.1.2. Precautions/Limitations:
 - 4.1.2.1. The ALS is used to attempt to create contrast between an impression and the substrate.
 - 4.1.2.2. Fluorescence may occur due to a naturally occurring substance within the latent print residue itself (inherent luminescence) which may have been transferred to the friction ridge skin via contamination and re-deposited, or fluorescence may be chemically induced in latent print residue with certain dyes and powders known to exhibit fluorescent properties. Fluorescence of the substrate may also occur.
- 4.1.3. Instruments/Equipment
 - 4.1.3.1. Alternate Light Source

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4.1.3.2. Filtered Goggles

4.1.3.3. Digital Camera

4.1.3.4. Camera Filters

4.1.4. Hazards/Safety:

4.1.4.1. The eyes are generally more vulnerable than the skin, and appropriate eye protection shall be used to protect them. Permanent eye damage can occur from reflected, refracted, or direct illumination to the eye. Filtered goggles or shields shall be utilized when using this equipment, as they provide protection from potentially harmful rays and provide additional enhancement for viewing latent prints.

4.1.4.2. Observe all safety precautions in the operator's manual.

4.1.5. Reference Materials/Controls/Calibration Checks:

4.1.5.1. Maintenance shall consist of cleaning the exterior of the ALS with a soft cloth dampened with a mild detergent solution and using a cotton swab moistened with glass cleaner to clean the optical filters. Bulbs should be replaced as needed.

4.1.5.2. If an ALS malfunctions, it will be taken out of service until it can be repaired. The ALS shall be labeled "out of service." Maintenance, service, etc. shall be recorded in the maintenance log.

4.1.5.3. No calibration is required of the ALS.

4.1.5.4. The manufacturer's operator manuals for this equipment shall be read prior to using the equipment.

4.1.6. Procedures/Instructions:

4.1.6.1. Turn the power rocker switch on. The fan will begin to operate. Make sure the fan comes to full operating speed. You should be able to hear the fan come up to speed in a few seconds.

4.1.6.2. Turn on the lamp switch. The lamp should turn on in a few seconds.

4.1.6.3. Choose the band-width you wish to use.

4.1.6.4. Observe evidence with the appropriate wavelength/goggle combination.

4.1.6.5. Observed prints are evaluated to determine their suitability for comparison.

4.1.6.6. Prints deemed to be suitable for comparison are marked and then photographed using the appropriate barrier filter.

4.1.6.7. Push the lamp rocker switch to off.

4.1.6.8. Wait for the unit to cool down. After feeling the body of the unit and the exhaust to determine that the unit is cool, the power rocker switch may be turned off. Allow the unit to run for longer periods of time instead of turning the unit off and on for short periods. Repeatedly turning the unit off and on will shorten the life of the lamp. The lamp should be left on for a minimum of ten-fifteen minutes.

4.2. Reflective Ultra-Violet Imaging System (RUVIS)

4.2.1. Scope: The RUVIS is an image-intensifying device that helps the analyst locate untreated latent prints and other evidence of forensic interest on non-porous surfaces by utilizing Reflective Ultra-Violet Imaging System

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technology (RUVIS). Ultra-violet (UV) light will reflect off of a fingerprint at a different wavelength or speed than it will off the substrate. The RUVIS converts this UV light into visible light, allowing the analyst to visualize the latent print.

4.2.2. Precautions/Limitations:

4.2.2.1. The RUVIS may be used on smooth, non-porous surfaces prior to any processing. However, Cyanoacrylate fuming before using the RUVIS often improves results.

4.2.2.2. If you are further than 6 inches from your object of interest, remove close-up lens for viewing.

4.2.3. Instruments/Equipment:

4.2.3.1. Short Wave 254nm Ultra-Violet Light Source

4.2.3.2. Reflective Ultra-Violet Imaging System

4.2.3.3. Eye Protection

4.2.3.4. Digital Camera

4.2.3.5. Adapter Lens

4.2.4. Hazards/Safety:

4.2.4.1. Never operate the UV lamps without wearing UV absorbing face shields or glasses, long sleeved shirts, and gloves when the lamps are in use. Failure to do so may result in severe burns, long-term injury to the eyes, or blindness.

4.2.4.2. Observe all safety precautions in the operator's manual.

4.2.5. Reference Materials/Controls/Calibration Checks:

4.2.5.1. Maintenance shall consist of cleaning the close-up lens, the ultraviolet filter, and the quartz lens. Turn the unit off, and clean each lens with ethanol.

4.2.5.2. For cleaning the main housing, use a soft cloth with a non-abrasive detergent.

4.2.5.3. When an image becomes noisy or loses brightness, charge battery.

4.2.5.4. Refer to the manufacturer's operator manual for any other service or troubleshooting issues.

4.2.5.5. If the RUVIS malfunctions, it shall be taken out of service until it can be repaired. The RUVIS shall be labeled "out of service." Maintenance, service, etc. shall be recorded in the maintenance log.

4.2.5.6. No calibration check is required of this unit.

4.2.6. Procedures/Instructions:

4.2.6.1. Attach the RUVIS to a tripod/copy stand or use it as a hand held device.

4.2.6.2. Make sure the close-up lens is attached for examination at 4-6 inches from the object.

4.2.6.3. Turn the RUVIS unit on and verify the red light is lit.

4.2.6.4. Turn on the ultra-violet light source.

4.2.6.4.1. The operator of the lamp and all others present should remain behind the light source when it is turned on.

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- 4.2.6.5. The UV light should be moved at varying angles from the surface of interest.
- 4.2.6.6. Point the RUVIS perpendicular to the surface.
- 4.2.6.7. Set the eyepiece to your personal eyesight.
- 4.2.6.8. Adjust the fine focus of the quartz lens or move the copy stand up or down.
- 4.2.6.9. Adjust the f-stop of RUVIS for depth of field.
- 4.2.6.10. If latent impressions are located, mark the location of the prints.
- 4.2.6.11. To Photograph:
 - 4.2.6.11.1. Screw the camera adapter onto the lens of your camera.
 - 4.2.6.11.2. Mount the camera to the eyepiece and lock the adapter to the RUVIS.
 - 4.2.6.11.3. Fully open the aperture of the camera.
 - 4.2.6.11.4. Fine focus the camera lens, do not adjust RUVIS lens.
 - 4.2.6.11.5. Once the examination is complete, turn all equipment off.

4.3. TracER Laser

- 4.3.1. Scope: The TracER is a fully portable, green output laser-based system designed for forensic evidence detection, particularly latent fingerprints, bio-material, semen and bone fragments. The TracER laser emits 532nm radiation.
- 4.3.2. Precautions/Limitations:
 - 4.3.2.1. The manufacturer's operator manuals for this equipment shall be read prior to using this equipment.
 - 4.3.2.2. Fluorescence may occur due to a naturally occurring substance within the latent print residue itself (inherent luminescence) which may have been transferred to the friction ridge skin via contamination and re-deposited, or fluorescence may be chemically induced in latent print residue with certain dyes and powders known to exhibit fluorescent properties. Fluorescence of the substrate may also occur.
- 4.3.3. Instrument/Equipment:
 - 4.3.3.1. TracER Laser
 - 4.3.3.2. Filtered Orange Goggles
 - 4.3.3.3. Digital Camera
 - 4.3.3.4. Camera Filter
- 4.3.4. Hazards/Safety:
 - 4.3.4.1. The eyes are generally more vulnerable than the skin, and appropriate eye protection shall be used to protect them. Permanent eye damage can occur from reflected, refracted, or direct illumination to the eye. Filtered goggles or shields shall be utilized when using this equipment as they provide protection from potentially harmful rays and provide additional enhancement for viewing latent prints.
 - 4.3.4.2. Observe all safety precautions in the operator's manual.
- 4.3.5. Reference Materials/Controls/Calibration Checks:

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- 4.3.5.1. Maintenance shall consist of cleaning the exterior of the laser with a soft cloth dampened with a mild detergent solution and using a cotton swab moistened with glass cleaner to clean the optical filter.
- 4.3.5.2. Refer to the manufacturer's operator manual for any other service or troubleshooting issues.
- 4.3.5.3. If the laser malfunctions, it shall be taken out of service until it can be repaired. The laser shall be labeled "out of service." Maintenance, service, etc. shall be recorded in the maintenance log.
- 4.3.5.4. No calibration check is required of the laser.
- 4.3.6. Procedures/Instructions:**
 - 4.3.6.1. Turn the power switch on.
 - 4.3.6.2. Have the Laser Control selected to F.P. for front panel control or to H.P. for hand piece control.
 - 4.3.6.3. If using front panel, turn power adjust knob completely counter clockwise.
 - 4.3.6.4. If using the hand piece, press the HI or LOW power option.
 - 4.3.6.5. Point hand piece at intended evidence.
 - 4.3.6.6. Turn the laser key switch to the on position.
 - 4.3.6.7. The shutter of the laser will open after 5-20 seconds.
 - 4.3.6.8. Press the hand piece trigger to emit the laser light.
 - 4.3.6.9. Scan evidence with filtered orange goggles.
 - 4.3.6.10. Observed prints are evaluated to determine their suitability for comparison.
 - 4.3.6.11. Prints deemed to be suitable for comparison are marked and are then photographed using the appropriate barrier filter.
 - 4.3.6.12. To turn laser off, set trigger to off position.
 - 4.3.6.13. Turn the laser key switch to the off position.
 - 4.3.6.14. Set power switch to off.

5. Physical Based Methods

5.1. Fingerprint Powders

- 5.1.1. Scope:** Powder particles physically adhere to latent print residue, allowing the latent print to be visualized. The coloring of the friction ridge residue occurs because the residue has greater adhesion properties than the substrate.
- 5.1.2. Precautions/Limitations:**
 - 5.1.2.1. Shelf Life: Indefinite
 - 5.1.2.2. Occasionally latent quality may be enhanced by repeated powdering and lifting of the same area.
 - 5.1.2.3. When powder-processing evidence and there is concern for DNA cross-contamination, disposable brushes and powder should be used to avoid cross-contamination. If disposable brushes are not available, brushes shall be decontaminated prior to use with the UV Crosslinker. The UV Crosslinker shall be set to 120,000 microjoules per cm² and the time exposure shall be set to two minutes. Magnetic wands shall be disinfected with a 70% Ethanol or 5% dilution bleach solution.

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5.1.3. Instruments/Equipment:

- 5.1.3.1. Fingerprint Brush
- 5.1.3.2. Magnetic Wand
- 5.1.3.3. Digital Camera
- 5.1.3.4. Lifters

5.1.4. Reagents/Materials:

- 5.1.4.1. Fingerprint Powders
- 5.1.4.2. Magnetic Fingerprint Powders

5.1.5. Hazards/Safety:

- 5.1.5.1. Powder – [Irritant](#).
- 5.1.5.2. Use ultra-violet protection goggles when working with ultra-violet light sources.
- 5.1.5.3. Refer to the Material Safety Data Sheet (MSDS) for more information.

5.1.6. Reference Materials/Controls/Calibration Checks:

- 5.1.6.1. Test impressions are generally not applicable. However, when there is doubt as to the suitability of a powder for processing a particular surface, a test impression should be made on a similar surface if available.

5.1.7. Procedures/Instructions:

5.1.7.1. Traditional Powders

- 5.1.7.1.1. Apply a small amount of powder to the brush and remove excess powder.
- 5.1.7.1.2. Brush in the direction of any ridges that begin to appear.
- 5.1.7.1.3. Build powder onto the ridges and stop when latent print reaches point of sufficient clarity.
- 5.1.7.1.4. The adherence of powder to a latent print may be enhanced by utilizing the “huffing technique.” Gently breathing on the surface while dusting for latent prints sometimes adds moisture to the latent print residue, thus enabling the powder to adhere more effectively. All visible moisture should be evaporated prior to powder application.
 - 5.1.7.1.4.1. Note: If the item has a pending DNA examination request, the “huffing technique” should not be utilized.
- 5.1.7.1.5. If too much powder is applied, it may be possible to remove excess powder by tapping the object, blowing air over the surface, or by brushing it out.
- 5.1.7.1.6. If a fluorescent powder is used, examine the items under a Laser or Alternate Light Source at the recommended wavelength with the appropriate barrier filter.
- 5.1.7.1.7. Developed prints are evaluated to determine their suitability for comparison.
- 5.1.7.1.8. Prints deemed to be suitable for comparison are marked and then photographed or lifted. If using

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fluorescent powder, prints should be photographed using the appropriate barrier filter.

5.1.7.2. Magnetic Powders

- 5.1.7.2.1. Place magna brush wand, with magnet engaged, into container of magnetic powder. This will produce a bristle-like effect at the end of the wand when withdrawn.
- 5.1.7.2.2. Apply in a circular motion to the surface being examined. Make sure that only the magnetic powder touches the surface, not the wand.
- 5.1.7.2.3. After the print has been developed, hold the wand over the container and withdraw the control rod. This will disengage the magnet and release the powder.
- 5.1.7.2.4. Re-engage the magnet and pass the clean wand over the developed latent print and the surrounding area to remove excess powder. Do not touch the surface.
- 5.1.7.2.5. If a magnetic fluorescent powder is used, examine the items under a Laser or Alternate Light Source at the recommended wavelength with the appropriate filter.
- 5.1.7.2.6. Developed prints are evaluated to determine their suitability for comparison.
- 5.1.7.2.7. Prints deemed to be suitable for comparison are marked and then photographed or lifted. If using fluorescent powder, prints should be photographed using the appropriate barrier filter.

5.2. Small Particle Reagent (SPR)

- 5.2.1. Scope: Small particle reagent (SPR) works like a liquid fingerprint powder on previously wet items by adhering to the fats and oils of the latent print residue resulting in a gray or white colored latent print.
- 5.2.2. Precautions/Limitations:
 - 5.2.2.1. Shelf Life: Indefinite
- 5.2.3. Instruments/Equipment:
 - 5.2.3.1. Digital Camera
 - 5.2.3.2. Lifters
- 5.2.4. Reagents/Materials:
 - 5.2.4.1. White SPR
 - 5.2.4.2. Gray SPR
 - 5.2.4.3. Water
- 5.2.5. Hazards/Safety:
 - 5.2.5.1. SPR – [Irritant](#).
 - 5.2.5.2. Refer to the Material Safety Data Sheet (MSDS) for more information.
- 5.2.6. Reference Materials/Controls/Calibration Checks:
 - 5.2.6.1. Testing of the SPR solution is performed prior to each use.

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- 5.2.6.2. The testing involves making prints on a test surface similar to the one being examined.
- 5.2.6.3. An analyst shall not proceed with the processing of evidence until a control test bearing positive results (development of a gray colored latent with traditional SPR or a white colored latent with white SPR) has been conducted and documented in the analyst's case notes.
- 5.2.6.4. The area surrounding the intentionally deposited latent print shall serve as a negative control.

5.2.7. Procedures/Instructions:

- 5.2.7.1. Shake the spray bottle of SPR thoroughly.
- 5.2.7.2. Spray the SPR onto the item being examined. If the location of the latent prints is known, spray the area above the prints and allow the SPR to flow over the prints. Otherwise, spray the area to be examined starting at the top and working downwards.
- 5.2.7.3. Gently rinse the processed area with tap water and allow it to dry.
- 5.2.7.4. Developed prints are evaluated to determine their suitability for comparison.
- 5.2.7.5. Prints deemed to be suitable for comparison are marked and then photographed or lifted.

5.3. Sticky Side Powder

- 5.3.1. Scope: Processing adhesives on the sticky sides of tape and other items, such as labels, presents problems in processing. Traditional powders will not work (unless modified) because the adhesive properties cause the powder to obscure latent print deposits. Sticky-side powder is a liquid fingerprint detection method that produces gray-black or white developed latent prints when applied to adhesive surfaces. Sticky-side powder detects the fatty/oily and/or epithelial cells often left when handling adhesive surfaces.

5.3.2. Precautions/Limitations:

- 5.3.2.1. Shelf Life: Working solution should be mixed fresh for each application.

5.3.3. Instruments/Equipment:

- 5.3.3.1. Beaker
- 5.3.3.2. Camel Hair Brush/soft brush
- 5.3.3.3. Digital Camera

5.3.4. Reagents/Materials:

- 5.3.4.1. Reagents:
 - 5.3.4.1.1. Sticky-Side Powder
 - 5.3.4.1.2. Black/White Powder
 - 5.3.4.1.3. Clear detergent or equivalent (Photo-flo, Liqui-Nox®),
 - 5.3.4.1.4. Tap or distilled water
- 5.3.4.2. Sticky-Side Powder Working Solution
 - 5.3.4.2.1. Mix a solution of water and clear detergent in a glass beaker in a 1:1 ratio.
 - 5.3.4.2.1.1. Note: Photo-Flo 100 does not need to be diluted with water.

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- 5.3.4.2.2. Mix approximately equal amounts of sticky-side powder into the detergent/water solution to make a liquid that is the consistency of paint. Mix a volume suitable for the application at hand.

5.3.5. Hazards/Safety:

- 5.3.5.1. Powder – [Irritant](#).
- 5.3.5.2. Liqui-Nox – [Irritant](#).
- 5.3.5.3. Photo Flo – [Irritant](#).
- 5.3.5.4. Refer to the Material Safety Data Sheet (MSDS) for more information.

5.3.6. Reference Materials/Controls/Calibration Checks:

- 5.3.6.1. Testing of the Sticky-Side Powder solution is performed prior to each use.
- 5.3.6.2. This test involves the making of a latent print on a test surface similar to the evidence being examined and following the processing procedure.
- 5.3.6.3. An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a gray-black/white print) has been conducted and documented in the analyst's case notes.
- 5.3.6.4. The area surrounding the intentionally deposited latent print shall serve as a negative control.

5.3.7. Procedures/Instructions:

- 5.3.7.1. The reagent is painted onto the adhesive surface with a soft brush or the item may be submersed in the solution.
- 5.3.7.2. When using the submersion method, ensure the adhesive side is up as some agitation may be necessary.
- 5.3.7.3. Allow the reagent to remain on the surface for 10 to 20 seconds.
- 5.3.7.4. Rinse with water.
- 5.3.7.5. Examine the adhesive surface for latent prints. The surface may be reprocessed to improve contrast and/or make the latent print(s) darker.
- 5.3.7.6. Allow the surface to dry thoroughly.
- 5.3.7.7. Developed prints are evaluated to determine their suitability for comparison.
- 5.3.7.8. Prints deemed to be suitable for comparison are marked and then photographed.

6. Chemical Based Methods

6.1. Acid Yellow 7

- 6.1.1. Scope: Acid Yellow 7 is a dye solution in a water/acetic acid/ethanol mixture that is used for staining blood a yellow color. It also fluoresces under blue/blue-green light. It can be used on non-absorbent items.
- 6.1.2. Precautions/Limitations:
 - 6.1.2.1. Shelf Life: Unknown
- 6.1.3. Instruments/Equipment:
 - 6.1.3.1. Beaker(s)
 - 6.1.3.2. Graduated Cylinder(s)

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- 6.1.3.3. Stir Bar(s)
- 6.1.3.4. Stir Plate(s)
- 6.1.3.5. Glass Tray(s)
- 6.1.3.6. Wash Bottle(s)
- 6.1.3.7. Dark Glass Bottle(s)
- 6.1.3.8. White Gel Lifters
- 6.1.3.9. ALS (Alternate Light Source)
- 6.1.3.10. Digital Camera
- 6.1.3.11. Camera Filters
- 6.1.4. Reagents/Materials:**
 - 6.1.4.1. Reagents
 - 6.1.4.1.1. Acid Yellow 7
 - 6.1.4.1.2. Glacial Acetic Acid
 - 6.1.4.1.3. Ethanol
 - 6.1.4.1.4. Distilled water
 - 6.1.4.1.5. 5-Sulfosalicylic Acid
 - 6.1.4.2. Blood Fixative
 - 6.1.4.2.1. Combine 20g 5-Sulfosalicylic Acid with 1000mL Distilled water on a stirring device until dissolved.
 - 6.1.4.3. Staining Solution
 - 6.1.4.3.1. Combine 1g Acid Yellow 7 and 700mL Distilled water on a stirring device until dissolved.
 - 6.1.4.3.2. Then add 50mL Glacial Acetic Acid and 250mL Ethanol to the solution.
 - 6.1.4.4. Washing Solution
 - 6.1.4.4.1. Combine 50mL Glacial Acetic Acid, 250mL Ethanol, and 700mL Distilled water.
- 6.1.5. Hazards/Safety:**
 - 6.1.5.1. Acid Yellow 7 – [Irritant](#).
 - 6.1.5.2. Glacial Acetic Acid – Severe [irritant](#); may cause burns. [Flammable](#). [Corrosive](#).
 - 6.1.5.3. Ethanol – [Irritant](#). [Flammable](#). [Poison](#). May cause fetal defects.
 - 6.1.5.4. 5-Sulfosalicylic Acid – Severe [irritant](#); may cause burns. [Corrosive](#).
 - 6.1.5.5. Use ultra-violet protection goggles when working with ultra-violet light sources.
 - 6.1.5.6. Refer to the Material Safety Data Sheet (MSDS) for more information.
- 6.1.6. Reference Materials/Controls/Calibration Checks:**
 - 6.1.6.1. Testing of Acid Yellow 7 is performed prior to each use.
 - 6.1.6.2. An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (known blood staining a fluorescent yellow color) has been conducted and documented in the analyst's case notes.
 - 6.1.6.3. The area surrounding the intentionally deposited blood stain shall serve as a negative control.
- 6.1.7. Procedures/Instructions:**

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- 6.1.7.1. Moisten a piece of absorbent paper that is sized to cover the prints with the Blood Fixative solution.
- 6.1.7.2. Once the wet paper entirely covers the print, leave it there for a minimum of 3 minutes. When the blood is a thick layer, leave the paper on the print for 5 or more minutes.
- 6.1.7.3. Remove the paper.
- 6.1.7.4. Immerse or irrigate the item with the Acid Yellow 7 Staining Solution.
- 6.1.7.5. Leave the staining solution on the item for 1 to 3 minutes.
- 6.1.7.6. Wash the surface of the item with the Washing Solution.
- 6.1.7.7. If a print is located on the floor, the wash solution may be removed with a vacuum cleaner that can handle water. Otherwise, remove with paper towels.
- 6.1.7.8. Examine the items with an Alternate Light Source at 400nm to 490nm and an orange filter.
- 6.1.7.9. Developed prints are evaluated to determine their suitability for comparison.
- 6.1.7.10. Prints deemed to be suitable for comparison are marked and then photographed with the appropriate barrier filter.

6.2. Amido Black

6.2.1. Scope: Amido Black is also known as Amido Black 10B, Amido Black 12B, Naphthol Blue Black, or Naphthalene Black. Amido black is a dye that stains the protein portion of blood a blue-black color.

6.2.2. Precautions/Limitations:

6.2.2.1. Shelf Life: Indefinite

6.2.3. Instruments/Equipment:

- 6.2.3.1. Beaker(s)
- 6.2.3.2. Graduated Cylinder(s)
- 6.2.3.3. Stir Bar(s)
- 6.2.3.4. Stir Plate(s)
- 6.2.3.5. Glass Tray(s)
- 6.2.3.6. Wash Bottle(s)
- 6.2.3.7. Dark Glass Bottle(s)
- 6.2.3.8. Digital Camera

6.2.4. Reagents/Materials:

6.2.4.1. Reagents

- 6.2.4.1.1. Amido Black
- 6.2.4.1.2. Citric Acid
- 6.2.4.1.3. Distilled Water
- 6.2.4.1.4. Photo Flo
- 6.2.4.1.5. Glacial Acetic Acid
- 6.2.4.1.6. Methanol

6.2.4.2. Water Base Solution

- 6.2.4.2.1. Citric Acid Stock Solution
 - 6.2.4.2.1.1. Dissolve 38g Citric Acid in 2000mL Distilled Water.
- 6.2.4.2.2. Developer Solution

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- 6.2.4.2.2.1. Combine 1000mL Citric Acid Stock Solution, 2g Amido Black, and 2mL Photo-Flo and place on a stirring device.
- 6.2.4.2.3. Rinse Solution
 - 6.2.4.2.3.1. Use the Citric Acid Stock Solution for the rinse.
- 6.2.4.2.4. Final Rinse
 - 6.2.4.2.4.1. Distilled Water is preferred; however, tap water can be used.
- 6.2.4.3. Methanol Based Solution
 - 6.2.4.3.1. Developer Solution
 - 6.2.4.3.1.1. Combine 2g Amido Black, 100mL Glacial Acetic Acid, and 900mL Methanol and place on a stirring device for approximately 30 minutes or until the Amido Black is dissolved.
 - 6.2.4.3.2. Rinse Solution
 - 6.2.4.3.2.1. Combine 100mL Glacial Acetic Acid and 900mL Methanol.
 - 6.2.4.3.3. Final Rinse
 - 6.2.4.3.3.1. Distilled water is preferred; however, tap water can be used.
- 6.2.5. Hazards/Safety:
 - 6.2.5.1. Amido Black – [Irritant](#).
 - 6.2.5.2. Citric Acid – [Irritant](#).
 - 6.2.5.3. Photo Flo – [Irritant](#).
 - 6.2.5.4. Glacial Acetic Acid – Severe [irritant](#); may cause burns. [Flammable](#). [Corrosive](#).
 - 6.2.5.5. Methanol – [Poison](#). [Flammable](#). [Irritant](#). May cause fetal defects.
 - 6.2.5.6. Refer to the Material Safety Data Sheet (MSDS) for more information.
- 6.2.6. Reference Materials/Controls/Calibration Checks:
 - 6.2.6.1. Testing of the Amido Black solution is performed prior to each use.
 - 6.2.6.2. An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (known blood staining a blue-black color) has been conducted and documented in the analyst's case notes.
 - 6.2.6.3. The area surrounding the intentionally deposited blood stain shall serve as a negative control.
- 6.2.7. Procedures/Instructions:
 - 6.2.7.1. Ensure that all blood is dry prior to application.
 - 6.2.7.2. Immerse the item in the Amido Black Working Solution for 30 seconds to 1 minute. Alternatively, the item may be sprayed or irrigated with the Amido Black Working Solution.
 - 6.2.7.3. Immerse or irrigate the item with the Rinse Solution to remove the excess dye.
 - 6.2.7.4. Resulting latent prints are a dark blue-black. Repeat the above process to improve contrast.

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- 6.2.7.5. Immerse or irrigate the item with distilled water once the desired contrast has been reached.
- 6.2.7.6. Allow the item to dry thoroughly.
- 6.2.7.7. Developed prints are evaluated to determine their suitability for comparison.
- 6.2.7.8. Prints deemed to be suitable for comparison are marked and then photographed.

6.3. Ardrex

6.3.1. Scope: Ardrex is a fluorescent dye stain used on nonporous items to enhance Cyanoacrylate developed latent prints.

6.3.2. Precautions/Limitations:

- 6.3.2.1. Shelf Life: 6 months
- 6.3.2.2. Avoid excess build-up of Cyanoacrylate as this may result in ridge detail depicting little contrast to the strongly fluorescent surface.
- 6.3.2.3. Surfaces that absorb too much of the dye stain will fluoresce, resulting in diminished contrast between the ridge detail and the fluorescent surface.
- 6.3.2.4. Items that inherently fluoresce in the 500nm range will interfere with the dye stain fluorescence.

6.3.3. Instruments/Equipment:

- 6.3.3.1. Beaker(s)
- 6.3.3.2. Graduated Cylinder(s)
- 6.3.3.3. Stir Bar(s)
- 6.3.3.4. Stir Plate(s)
- 6.3.3.5. Glass Tray(s)
- 6.3.3.6. Wash Bottle(s)
- 6.3.3.7. Dark Glass Bottle(s)
- 6.3.3.8. ALS (Alternate Light Source)
- 6.3.3.9. Digital Camera
- 6.3.3.10. Camera Filters

6.3.4. Reagents/Materials:

6.3.4.1. Reagents

- 6.3.4.1.1. Ardrex P133D
- 6.3.4.1.2. Acetone
- 6.3.4.1.3. Methanol
- 6.3.4.1.4. Isopropanol
- 6.3.4.1.5. Acetonitrile
- 6.3.4.1.6. Petroleum ether
- 6.3.4.1.7. Methyl Ethyl Ketone
- 6.3.4.1.8. Distilled water

6.3.4.2. Working Solution 1

- 6.3.4.2.1. Combine 2mL Ardrex, 10mL Acetone, 25mL Methanol, 10mL Isopropanol, 8mL Acetonitrile, and 945mL Petroleum ether in this exact order.
- 6.3.4.2.2. Do not mix with a magnetic stirrer.

6.3.4.3. Working Solution 2

- 6.3.4.3.1. Combine 1mL Ardrex P133D, 9mL Isopropanol, 15mL Methyl Ethyl Ketone, and 50mL Distilled water.

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6.3.4.3.2. Shake vigorously before applying to surface.

6.3.5. Hazards/Safety:

- 6.3.5.1. Ardrex P133D – [Irritant](#)
- 6.3.5.2. Acetone – [Flammable](#). [Irritant](#).
- 6.3.5.3. Methanol – [Poison](#). [Flammable](#). [Irritant](#). May cause fetal defects.
- 6.3.5.4. Isopropanol/2-propanol – [Flammable](#). [Irritant](#).
- 6.3.5.5. Acetonitrile – [Flammable](#). [Irritant](#). May cause fetal defects.
- 6.3.5.6. Petroleum ether – [Flammable](#). [Irritant](#). [Carcinogen](#).
- 6.3.5.7. Methyl Ethyl Ketone – [Flammable](#). [Irritant](#).
- 6.3.5.8. Use ultra-violet protection goggles when working with ultra-violet light sources.
- 6.3.5.9. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.3.6. Reference Materials/Controls/Calibration Checks:

- 6.3.6.1. Testing of Ardrex dye stain is performed prior to each use.
- 6.3.6.2. An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a fluorescent yellow print) has been conducted and documented in the analyst's case notes.
- 6.3.6.3. The area surrounding the intentionally deposited latent print shall serve as a negative control.

6.3.7. Procedures/Instructions:

- 6.3.7.1. Spray, dip, brush, or use a squirt bottle to apply the Ardrex dye.
- 6.3.7.2. Rinse with cold tap water.
- 6.3.7.3. Allow the items to dry thoroughly.
- 6.3.7.4. Examine the items under a Laser or Alternate Light Source at 280nm to 365nm with a yellow filter.
- 6.3.7.5. Developed prints are evaluated to determine their suitability for comparison.
- 6.3.7.6. Prints deemed to be suitable for comparison are marked and then photographed with the appropriate barrier filter.

6.4. Chemical Fuming

6.4.1. Scope: Chemical fuming develops prints on the thermal surface of thermal paper. When using hydrochloric acid, this procedure is often referred to as HCL fuming.

6.4.2. Precautions/Limitations:

- 6.4.2.1. Shelf Life: Indefinite

6.4.3. Instruments/Equipment:

- 6.4.3.1. Beaker
- 6.4.3.2. Digital Camera/Scanner

6.4.4. Reagents/Materials:

- 6.4.4.1. Reagents
 - 6.4.4.1.1. Acetic Acid
 - 6.4.4.1.2. Acetone
 - 6.4.4.1.3. Ethanol
 - 6.4.4.1.4. Methanol
 - 6.4.4.1.5. Ethyl Acetate
 - 6.4.4.1.6. Hydrochloric Acid

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6.4.5. Hazards/Safety:

- 6.4.5.1. Acetic Acid – Severe [irritant](#); may cause burns. [Flammable](#). [Corrosive](#).
- 6.4.5.2. Acetone – [Flammable](#). [Irritant](#).
- 6.4.5.3. Ethanol – [Flammable](#). [Irritant](#). [Poison](#). May cause fetal defects.
- 6.4.5.4. Methanol – [Poison](#). [Flammable](#). [Irritant](#). May cause fetal defects.
- 6.4.5.5. Ethyl Acetate – [Flammable](#). [Irritant](#).
- 6.4.5.6. Hydrochloric Acid – [Corrosive](#). Severe [irritant](#); may cause burns. [Poison](#).
- 6.4.5.7. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.4.6. Reference Materials/Controls/Calibration Checks:

- 6.4.6.1. Testing of the chemical is performed prior to each use.
- 6.4.6.2. An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (color change of print) has been conducted and documented in the analyst's case notes.
- 6.4.6.3. The area surrounding the intentionally deposited print shall serve as a negative control.

6.4.7. Procedures/Instructions:

- 6.4.7.1. Pour one chemical from above into a beaker.
- 6.4.7.2. Hold item with the thermal side down (towards the fumes) over the beaker. DO NOT allow the item to come in contact with the chemical.
- 6.4.7.3. Move item over chemical fumes until desired contrast is reached.
- 6.4.7.4. Developed prints are evaluated to determine their suitability for comparison.
- 6.4.7.5. Prints deemed to be suitable for comparison are marked and then photographed or scanned.

6.5. Coomassie Brilliant Blue

6.5.1. Scope: Coomassie Brilliant Blue is also known as Coomassie Blue. It is a dye that stains the protein portion of blood a blue color. The contrast achieved by this reagent is not as strong as that achieved by Amido Black due to the lighter color of the stain and the development of the surface's background.

6.5.2. Precautions/Limitations:

- 6.5.2.1. Shelf Life: Indefinite

6.5.3. Instruments/Equipment:

- 6.5.3.1. Beaker(s)
- 6.5.3.2. Graduated Cylinder(s)
- 6.5.3.3. Stir Bar(s)
- 6.5.3.4. Stir Plate(s)
- 6.5.3.5. Glass Tray(s)
- 6.5.3.6. Wash Bottle(s)
- 6.5.3.7. Dark Glass Bottle(s)
- 6.5.3.8. Digital Camera

6.5.4. Reagents/Materials:

- 6.5.4.1. Reagents
 - 6.5.4.1.1. Coomassie Brilliant Blue

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- 6.5.4.1.2. Methanol
- 6.5.4.1.3. Distilled Water
- 6.5.4.1.4. Glacial Acetic Acid
- 6.5.4.2. Dye Solution
 - 6.5.4.2.1. Combine 4g Coomassie Blue, 200mL Methanol, 200mL Distilled water, and 40mL Glacial Acetic Acid on a stirring device until the Coomassie Blue is dissolved.
- 6.5.4.3. Rinse Solution
 - 6.5.4.3.1. Combine 450mL Methanol, 450mL Distilled water, and 100mL Glacial Acetic Acid.
- 6.5.4.4. Final Rinse
 - 6.5.4.4.1. Distilled water is preferred; however, tap water can be used.

6.5.5. Hazards/Safety:

- 6.5.5.1. Coomassie Blue/Brilliant Blue R – [Irritant](#).
- 6.5.5.2. Methanol – [Poison](#). [Flammable](#). [Irritant](#). May cause fetal defects.
- 6.5.5.3. Glacial Acetic Acid – Severe [irritant](#); may cause burns. [Flammable](#). [Corrosive](#).
- 6.5.5.4. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.5.6. Reference Materials/Controls/Calibration Checks:

- 6.5.6.1. Testing of the Coomassie Blue solution is performed prior to each use.
- 6.5.6.2. An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (known blood stained a blue color) has been conducted and documented in the analyst's case notes.
- 6.5.6.3. The area surrounding the intentionally deposited blood stain shall serve as a negative control.

6.5.7. Procedures/Instructions:

- 6.5.7.1. Ensure that all blood is dry prior to application.
- 6.5.7.2. Immerse or irrigate the item in the Coomassie Blue dye solution for 30 to 90 seconds.
- 6.5.7.3. Immerse or irrigate the item with the Rinse Solution to remove the excess dye.
- 6.5.7.4. Resulting latent prints are blue. Repeat the above process to improve contrast.
- 6.5.7.5. Immerse or irrigate the item with distilled water once the desired contrast has been reached.
- 6.5.7.6. Allow the item to dry thoroughly.
- 6.5.7.7. Developed prints are evaluated to determine their suitability for comparison.
- 6.5.7.8. Prints deemed to be suitable for comparison are marked and are then photographed.

6.6. Cyanoacrylate Fuming

- 6.6.1. Scope: Fuming with Cyanoacrylate (super glue) is a process that is used to visualize latent print deposits on non-porous and some semiporous objects.

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When superglue vapors contact moisture and other components of friction ridge residue, the Cyanoacrylate polymerizes fixing the latents to the surface. This makes the friction ridge residue less easily damaged. Cyanoacrylate processing also prepares the surface for the acceptance of powders and dye-stains which may enable further visualization of the latent prints.

6.6.2. Precautions/Limitations:

- 6.6.2.1. Cyanoacrylate can be stored in the freezer prior to opening to prolong its life.
- 6.6.2.2. Cyanoacrylate can be stored in the refrigerator once opened to prolong its life.

6.6.3. Instruments/Equipment:

- 6.6.3.1. Automated Fuming Cabinet
- 6.6.3.2. Container
- 6.6.3.3. Hot Plate
- 6.6.3.4. Humidifier
- 6.6.3.5. Vacuum Chamber
- 6.6.3.6. Digital Camera
- 6.6.3.7. Aluminum Boat/Container

6.6.4. Reagents/Materials:

- 6.6.4.1. Cyanoacrylate/Superglue
- 6.6.4.2. Water

6.6.5. Hazards/Safety:

- 6.6.5.1. Cyanoacrylate/Superglue – [Irritant](#).
- 6.6.5.2. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.6.6. Reference Materials/Controls/Calibration Checks:

- 6.6.6.1. Testing of Cyanoacrylate fuming and processing are performed at the same time.
- 6.6.6.2. A test print is applied to a non-porous surface and placed into the cabinet/chamber in an easily monitored position.
- 6.6.6.3. When the development of the control test is complete, the questioned surface is also finished. Positive results are indicated by development of a white print and this shall be documented in the analyst's case notes.
- 6.6.6.4. The area surrounding the intentionally deposited latent print shall serve as a negative control.

6.6.7. Procedures/Instructions:

- 6.6.7.1. Automated Fuming Cabinet
 - 6.6.7.1.1. Place the items to be processed in the cabinet (suspend if possible).
 - 6.6.7.1.2. Place a control inside the cabinet.
 - 6.6.7.1.3. Turn the power on to the Automated Fuming Cabinet.
 - 6.6.7.1.4. Check the water level in the humidifier. It is recommended that distilled water be used.
 - 6.6.7.1.5. Place Cyanoacrylate in a metal dish and put it on the hot plate.
 - 6.6.7.1.6. Secure the door to the cabinet.

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- 6.6.7.1.7. Set the desired cycle fuming time (this is dependent on size and type of object being processed as well as the size of the cabinet). Proper development is achieved when ridge characteristics on the control turn slightly white in color and begin to show good contrast. In the event of under fuming, the item may be re-fumed.
- 6.6.7.1.8. Set the desired humidity level.
- 6.6.7.1.9. At any time the purge cycle can be pressed to evacuate the cabinet; otherwise, at the end of the fuming cycle the cabinet will automatically purge itself. Never attempt to open the door without first running the purge cycle.
- 6.6.7.1.10. Remove the item from the cabinet and examine it for comparable ridge detail.
- 6.6.7.1.11. Developed prints are evaluated to determine their suitability for comparison.
- 6.6.7.1.12. Prints deemed to be suitable for comparison are marked and then photographed.
- 6.6.7.2. Vacuum Chamber Method
 - 6.6.7.2.1. Place the items to be processed inside the chamber. It is not necessary to unfold items or leave large amounts of space between items of evidence. *Do not place pressurized items such as sealed cans, bottles, etc. in the chamber as they may explode.*
 - 6.6.7.2.2. Place a control inside the chamber.
 - 6.6.7.2.3. Put a small volume of Cyanoacrylate in a small dish or folded-up piece of aluminum foil.
 - 6.6.7.2.4. Put the lid on the chamber and close the release valve.
 - 6.6.7.2.5. Turn on the vacuum pump. Open the Gas Ballast Valve about one half of a turn and open the Blankoff Valve several turns.
 - 6.6.7.2.6. To help the lid seal properly, press down on the lid until the chamber begins to evacuate.
 - 6.6.7.2.7. After the vacuum pump has begun to evacuate the chamber, close the Gas Ballast Valve.
 - 6.6.7.2.8. Evacuate the chamber to approximately 25 inches of Mercury as shown on the chamber gauge.
 - 6.6.7.2.9. When the pressure reaches 25 inches of Mercury, close the Blankoff Valve.
 - 6.6.7.2.10. Turn off the pump and leave the items in the chamber under vacuum for approximately 20 minutes.
 - 6.6.7.2.11. If items are left longer, there is no danger of over-fuming.
 - 6.6.7.2.12. When ready, allow air back into the chamber by slowly opening the release valve on the chamber.

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- 6.6.7.2.13. Remove the lid, making sure to stand back from the opening of the chamber.
- 6.6.7.2.14. Remove the items from the chamber. It is recommended to allow the items to air dry for approximately 10 to 15 minutes before dusting or processing with liquid dye staining chemicals.
- 6.6.7.2.15. Developed prints are evaluated to determine their suitability for comparison.
- 6.6.7.2.16. Prints deemed to be suitable for comparison are marked and then photographed.
- 6.6.7.3. Non-Standard Container Method
 - 6.6.7.3.1. Place the items to be processed in the container (suspend if possible).
 - 6.6.7.3.2. Place a control inside the container.
 - 6.6.7.3.3. Fill a cup with hot water and place inside the container.
 - 6.6.7.3.4. Place Cyanoacrylate in a metal dish and put it on the hot plate.
 - 6.6.7.3.5. Close the container.
 - 6.6.7.3.6. Fuming time should be approximately 20 minutes (this is dependent on size and type of object being processed). Monitor your control to achieve proper development. Proper development is achieved when ridge characteristics on the control turn slightly white in color and begin to show good contrast. In the event of under fuming, the item may be re-fumed.
 - 6.6.7.3.7. The container should be opened in a well-ventilated area.
 - 6.6.7.3.8. Remove the item from the container and examine it for comparable ridge detail.
 - 6.6.7.3.9. Developed prints are evaluated to determine their suitability for comparison.
 - 6.6.7.3.10. Prints deemed to be suitable for comparison are marked and then photographed.
- 6.7. **1, 8 – Diazafluoren-9-one (DFO)**
 - 6.7.1. Scope: DFO is used to develop latent prints on porous surfaces. DFO reacts with amino acids. When this reaction is complete, the developed latent prints will fluoresce with the use of a laser or an alternate light source (ALS).
 - 6.7.2. Precautions/Limitations:
 - 6.7.2.1. Shelf Life: 6 months
 - 6.7.2.2. Faint latent prints may be made to fluoresce brighter with a second or third application of DFO. The second or third applications of DFO (if necessary) are performed in the same manner as the first.
 - 6.7.3. Instruments/Equipment:
 - 6.7.3.1. Beaker(s)
 - 6.7.3.2. Graduated Cylinder(s)
 - 6.7.3.3. Stir Bar(s)

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- 6.7.3.4. Stir Plate(s)
- 6.7.3.5. Glass Tray(s)
- 6.7.3.6. Wash Bottle(s)
- 6.7.3.7. Dark Glass Bottle(s)
- 6.7.3.8. ALS (Alternate Light Source) or Laser
- 6.7.3.9. Digital Camera
- 6.7.3.10. Camera Filters
- 6.7.4. Reagents/Materials for Methanol and Ethyl Acetate Solution:**
 - 6.7.4.1. Reagents
 - 6.7.4.1.1. DFO
 - 6.7.4.1.2. Methanol
 - 6.7.4.1.3. Ethyl Acetate
 - 6.7.4.1.4. Glacial Acetic Acid
 - 6.7.4.2. Stock Solution
 - 6.7.4.2.1. Combine 1g DFO, 200mL Methanol, 200mL Ethyl Acetate, and 40mL Glacial Acetic Acid on a stirring device until everything is dissolved.
 - 6.7.4.3. Working Solution
 - 6.7.4.3.1. Dilute the stock to 2 Liters with Petroleum Ether. The working solution should be a clear gold color.
- 6.7.5. Reagents/Materials for HFE-7100 Working Solution**
 - 6.7.5.1. Reagents
 - 6.7.5.1.1. DFO
 - 6.7.5.1.2. Methanol
 - 6.7.5.1.3. Glacial Acetic Acid
 - 6.7.5.1.4. HFE-7100
 - 6.7.5.2. HFE-7100 Solution shall be used prior to Oil Red O.
 - 6.7.5.3. Mixing a working solution
 - 6.7.5.3.1. In a 250 ml beaker, dissolve 0.25 grams DFO in 40 ml of methanol.
 - 6.7.5.3.2. Add 20 ml Glacial Acetic Acid.
 - 6.7.5.3.3. Continue mixing until all the DFO has dissolved into solution.
 - 6.7.5.3.4. Transfer this "stock solution" to a one liter beaker.
 - 6.7.5.3.5. Stir in 940 ml of HFE-7100.
 - 6.7.5.3.6. Cover and allow the solution to settle for approximately 30 minutes. A thick, oily-looking film may form on the top of the solution. This film consists of water, excess ethanol and DFO and must be removed prior to use. The film can be removed by any of the following procedures:
 - 6.7.5.3.6.1. If available, process the working solution through a separatory funnel. Again, allow the solution to settle for at least 30 minutes. Drain the bottom phase into a squirt bottle or storage container. Stop draining when the separate, clear-looking solution nears the bottom of the funnel, or approximately 50-100

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ml of solution remains in the funnel. This remaining solution should be discarded in a proper waste container for flammable solvents as it consists of undissolved ethanol, water, and DFO.

6.7.5.3.6.2. If a separatory funnel is not available, use a pipette to skim the oily film from the top, again discarding the waste in a proper waste receptacle.

6.7.5.3.6.3. If neither a separatory funnel nor pipette is available, simply transfer the solution into a squirt bottle. This will help ensure a clean solution. When the solution level is below the straw in the squirt bottle, discard the remaining solution in a proper waste receptacle.

6.7.5.3.7. When not in use, protect from direct light to preserve the shelf life of the solution.

6.7.6. Hazards/Safety:

6.7.6.1. DFO – [Irritant](#). Possible [carcinogen](#).

6.7.6.2. Methanol – [Poison](#). [Flammable](#). [Irritant](#). May cause fetal defects.

6.7.6.3. Ethyl Acetate – [Flammable](#). [Irritant](#).

6.7.6.4. Glacial Acetic Acid – Severe [irritant](#); may cause burns. [Flammable](#). [Corrosive](#).

6.7.6.5. HFE-7100 – [Irritant](#).

6.7.6.6. Use ultra-violet protection goggles when working with ultra-violet light sources.

6.7.6.7. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.7.7. Reference Materials/Controls/Calibration Checks:

6.7.7.1. Testing of DFO is performed prior to each use.

6.7.7.2. An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a fluorescent yellow-green print) has been conducted and documented in the analyst's case notes.

6.7.7.3. The area surrounding the intentionally deposited latent print shall serve as a negative control.

6.7.8. Procedures/Instructions:

6.7.8.1. DFO may be applied to the item by spraying or immersing the item in the solution.

6.7.8.2. Allow the item to dry thoroughly.

6.7.8.3. Place in an oven at approximately 100°C (212°F) for 20 minutes.

6.7.8.4. If an oven is not available, a dry iron may be used. Place a thick towel or other protective material on the counter, followed by the evidence, and then a few paper towels.

6.7.8.5. Examine the items under a laser or Alternate Light Source at 485nm to 510nm with an orange or red filter.

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- 6.7.8.6. Developed prints are evaluated to determine their suitability for comparison.
- 6.7.8.7. Prints deemed to be suitable for comparison are marked and then photographed with the appropriate barrier filter.

6.8. Gentian Violet

- 6.8.1.** Scope: Gentian Violet or Crystal Violet is a biological stain used to dye epithelial cells and fatty components of latent print residues a purple color. It is used to visualize latent print deposits on many types of adhesive surfaces. Due to the toxic nature of this reagent, it should only be used in small quantities with the appropriate safety precautions observed.
- 6.8.2.** Precautions/Limitations:
 - 6.8.2.1. Shelf Life: Indefinite
- 6.8.3.** Instruments/Equipment:
 - 6.8.3.1. Beaker(s)
 - 6.8.3.2. Graduated Cylinder(s)
 - 6.8.3.3. Stir Bar(s)
 - 6.8.3.4. Stir Plate(s)
 - 6.8.3.5. Glass Tray(s)
 - 6.8.3.6. Wash Bottle(s)
 - 6.8.3.7. Dark Glass Bottle(s)
 - 6.8.3.8. ALS (Alternate Light Source)
 - 6.8.3.9. Digital Camera
 - 6.8.3.10. Camera Filters
- 6.8.4.** Reagents/Materials:
 - 6.8.4.1. Reagents
 - 6.8.4.1.1. Gentian Violet or Crystal Violet
 - 6.8.4.1.2. Distilled Water
 - 6.8.4.2. Gentian Violet Working Solution
 - 6.8.4.2.1. Dissolve 1g Gentian Violet in 1000mL distilled water by stirring for approximately 25 minutes on a stir plate.
- 6.8.5.** Hazards/Safety:
 - 6.8.5.1. Gentian violet/crystal violet - Possible [carcinogen](#). [Irritant](#).
 - 6.8.5.2. Use ultra-violet protection goggles when working with ultra-violet light sources.
 - 6.8.5.3. Refer to the Material Safety Data Sheet (MSDS) for more information.
- 6.8.6.** Reference Materials/Controls/Calibration Checks:
 - 6.8.6.1. Testing of Gentian Violet is performed prior to each use.
 - 6.8.6.2. This test involves making a latent print on a test surface similar to the evidence being examined and following the processing procedure.
 - 6.8.6.3. An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a purple print) has been conducted and documented in the analyst's case notes.
 - 6.8.6.4. The area surrounding the intentionally deposited latent print shall serve as a negative control.

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6.8.7. Procedures/Instructions:

- 6.8.7.1. Pour a sufficient amount of working solution into a glass tray.
- 6.8.7.2. Immerse the adhesive side into the working solution for 1 to 2 minutes.
- 6.8.7.3. Rinse with cold tap water.
- 6.8.7.4. The above process may be repeated until optimal development of latent prints is achieved.
- 6.8.7.5. Examine the items under an Alternate Light Source at 505 nm to 570 nm with red goggles.
- 6.8.7.6. Developed prints are evaluated to determine their suitability for comparison.
- 6.8.7.7. Prints deemed to be suitable for comparison are marked and are then photographed with the appropriate barrier filter.

6.9. Gun Blueing

6.9.1. Scope: Gun blueing contains cupric salt and selenious acid. Cupric ions and selenious acid are reduced by the oxidized (etched) metals of copper, aluminum, zinc & iron. The reagent etches the cartridge's metal surface not protected by sebaceous-containing latent print residue, and deposits a dark-colored Cu-Se coating to reveal friction ridge detail.

6.9.2. Precautions/Limitations:

- 6.9.2.1. Shelf Life: Indefinite
- 6.9.2.2. If the cartridges/cartridge cases will also be examined by the firearms unit, do not submerge the head stamp portion in the gun blue solution. Rubber tipped pliers should be used to hold the cartridge/cartridge case.
- 6.9.2.3. This process is only to be used on brass cartridges/cartridge cases.

6.9.3. Instruments/Equipment:

- 6.9.3.1. Beakers
- 6.9.3.2. Digital Camera

6.9.4. Reagents/Materials:

- 6.9.4.1. Reagents
 - 6.9.4.1.1. Liquid Gun Blue
 - 6.9.4.1.2. Distilled Water
- 6.9.4.2. Working Solution
 - 6.9.4.2.1. Make a diluted solution of Gun Blue to distilled water.
 - 6.9.4.2.1.1. Note: The brand of Gun Blue and the ratio of Gun Blue to distilled water shall be documented in the analyst's laboratory case notes.

6.9.5. Hazards/Safety:

- 6.9.5.1. Gun blue – [Irritant](#). [Poison](#). [Corrosive](#).
- 6.9.5.2. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.9.6. Reference Materials/Controls/Calibration Checks:

- 6.9.6.1. Testing of Gun Blue is performed prior to each use.
- 6.9.6.2. This test involves making a latent print on a cartridge or cartridge case and following the processing procedure.

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- 6.9.6.3. An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a contrasting latent print) has been conducted and documented in the analyst's case notes.
- 6.9.6.4. The area surrounding the intentionally deposited latent print shall serve as a negative control.
- 6.9.7. Procedures/Instructions:
 - 6.9.7.1. Cartridges should first be lightly fumed with Cyanoacrylate.
 - 6.9.7.2. Immerse cartridges in the working solution.
 - 6.9.7.3. Gently move cartridges around in the working solution.
 - 6.9.7.4. Monitor closely for development.
 - 6.9.7.5. Halt development by immersing the cartridge in distilled water for 2 minutes. Allow the cartridges to air dry.
 - 6.9.7.6. Developed prints are evaluated to determine their suitability for comparison.
 - 6.9.7.7. Prints deemed to be suitable for comparison are marked and are then photographed.

6.10. Leucocrystal Violet (LCV)

6.10.1. Scope: Leucocrystal violet (LCV) is the completely reduced form of Crystal Violet and is colorless. When LCV and hydrogen peroxide come into contact with the hemoglobin in blood, a catalytic reaction occurs and the solution turns to a purple/violet color. LCV can be used on porous and nonporous items, and Amido Black may still be used after LCV.

6.10.2. Precautions/Limitations:

- 6.10.2.1. Shelf Life: 3 months at room temperature, 9 months refrigerated
- 6.10.2.2. Background development may occur under intense light due to photo ionization of the dye.
- 6.10.2.3. LCV may react to other substances, not specific to blood.
- 6.10.2.4. Cyanoacrylate fuming may be detrimental to this procedure.

6.10.3. Instruments/Equipment:

- 6.10.3.1. Spray Bottle
- 6.10.3.2. Beaker(s)
- 6.10.3.3. Graduated Cylinder(s)
- 6.10.3.4. Stir Bar(s)
- 6.10.3.5. Stir Plate(s)
- 6.10.3.6. Glass Tray(s)
- 6.10.3.7. Wash Bottle(s)
- 6.10.3.8. Dark Glass Bottle(s)
- 6.10.3.9. Digital Camera

6.10.4. Reagents/Materials:

- 6.10.4.1. Reagents
 - 6.10.4.1.1. 5-Sulfosalicylic Acid
 - 6.10.4.1.2. 3% Hydrogen Peroxide
 - 6.10.4.1.3. Sodium Acetate
 - 6.10.4.1.4. Leucocrystal violet
- 6.10.4.2. Working Solution
 - 6.10.4.2.1. Dissolve 10g of 5-Sulfosalicylic Acid in 500mL of 3% Hydrogen Peroxide.

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6.10.4.2.2. Add and dissolve 4.4g Sodium Acetate.

6.10.4.2.3. Add and dissolve 1.1g Leucocrystal Violet

6.10.4.3. Note: If the Leucocrystal Violet crystals have become yellow instead of white they are no longer good.

6.10.5. Hazards/Safety:

6.10.5.1. 5-Sulfosalicylic Acid – Severe [irritant](#); may cause burns. [Corrosive](#).

6.10.5.2. 3% Hydrogen Peroxide – [Oxidizer](#). [Flammable](#). [Corrosive](#). Severe [irritant](#); may cause burns.

6.10.5.3. Sodium Acetate – [Irritant](#).

6.10.5.4. Leucocrystal violet – [Irritant](#).

6.10.5.5. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.10.6. Reference Materials/Controls/Calibration Checks:

6.10.6.1. Testing of LCV is performed prior to each use.

6.10.6.2. An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (known blood staining a purple color) has been conducted and documented in the analyst's case notes.

6.10.6.3. The area surrounding the intentionally deposited blood stain shall serve as a negative control.

6.10.7. Procedures/Instructions:

6.10.7.1. Spray the blood impression using a fine-mist sprayer. Development should occur within 30 seconds.

6.10.7.2. Developed prints are evaluated to determine their suitability for comparison.

6.10.7.3. Prints deemed to be suitable for comparison are marked and then photographed.

6.11. Ninhydrin

6.11.1. Scope: Ninhydrin (triketohydrindene hydrate) reacts with the amino acids and proteins present in the latent print deposit to produce a characteristic purple color (Rhuemann's Purple). The combination of heat and humidity accelerates the reaction of the amino acids and Ninhydrin.

6.11.2. Precautions/Limitations:

6.11.2.1. Shelf Life: 1 year

6.11.2.2. Latent prints composed of blood on porous items can often be successfully darkened with the application of Ninhydrin.

6.11.2.3. Surfaces that need other forensic examinations such as Forensic Document examinations should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.

6.11.3. Instruments/Equipment:

6.11.3.1. Beaker(s)

6.11.3.2. Graduated Cylinder(s)

6.11.3.3. Stir Bar(s)

6.11.3.4. Stir Plate(s)

6.11.3.5. Glass Tray(s)

6.11.3.6. Wash Bottle(s)

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- 6.11.3.7. Dark Glass Bottle(s)
- 6.11.3.8. ALS (Alternate Light Source) or Laser
- 6.11.3.9. Digital Camera or Scanner
- 6.11.3.10. Camera Filters
- 6.11.4. Reagents/Materials For Petroleum Ether Based Working Solution:**
 - 6.11.4.1. Reagents
 - 6.11.4.1.1. Ninhydrin
 - 6.11.4.1.2. Methanol
 - 6.11.4.1.3. Isopropanol
 - 6.11.4.1.4. Petroleum Ether
 - 6.11.4.2. Mixing Instructions for Petroleum Ether Based Working Solution
 - 6.11.4.2.1. Combine 5g Ninhydrin, 30mL Methanol, 40mL Isopropanol, and 930mL Petroleum Ether, in this exact order, on a stirring device, allowing the solution to stir between each additional reagent.
 - 6.11.4.2.2. Continue stirring until all crystals are dissolved.
- 6.11.5. Reagents/Materials For Acetone Based Working Solution**
 - 6.11.5.1. Reagents
 - 6.11.5.1.1. Ninhydrin
 - 6.11.5.1.2. Acetone
 - 6.11.5.1.2.1. Mixing Instructions For Acetone Based Working Solution
 - 6.11.5.1.2.1.1. Combine 6g Ninhydrin and 1000mL Acetone on a stirring device until all crystals are dissolved.
- 6.11.6. Reagents/ Materials For HFE-7100 Working Solution**
 - 6.11.6.1. This solution should be used before the use of Oil Red O.
 - 6.11.6.2. Reagents
 - 6.11.6.2.1. Ninhydrin
 - 6.11.6.2.2. HFE-7100
 - 6.11.6.2.3. Ethanol
 - 6.11.6.2.4. Ethyl Acetate
 - 6.11.6.2.5. Glacial Acetic Acid
 - 6.11.6.3. Mixing Instructions for HFE-7100 Working Solution
 - 6.11.6.3.1. In a 250 ml beaker, dissolve 5 grams Ninhydrin crystals in 45 ml Ethanol.
 - 6.11.6.3.2. Add 2 ml Ethyl Acetate.
 - 6.11.6.3.3. Add 5 ml Glacial Acetic Acid.
 - 6.11.6.3.4. Continue mixing until all the Ninhydrin has dissolved into solution.
 - 6.11.6.3.5. Transfer this "stock solution" to a one liter beaker.
 - 6.11.6.3.6. Stir in one liter of HFE-7100. Mix until a milky yellow solution is formed.
 - 6.11.6.3.7. Cover and allow the solution to settle for approximately 30 minutes. A thick, oily-looking film may form on the top of the solution. This film consists of water, excess ethanol and ninhydrin and

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must be removed prior to use. The film can be removed by any of the following procedures:

- 6.11.6.3.7.1. If available, process the working solution through a separatory funnel. Again, allow the solution to settle for at least 30 minutes. Drain the bottom phase into a squirt bottle or storage container. Stop draining when the separate, clear-looking solution nears the bottom of the funnel, or approximately 50-100 ml of solution remains in the funnel. This remaining solution should be discarded in a proper waste container for flammable solvents as it consists of undissolved ethanol, water, and ninhydrin.
- 6.11.6.3.7.2. If a separatory funnel is not available, use a pipette to skim the oily film from the top, again discarding the waste in a proper waste receptacle.
- 6.11.6.3.7.3. If neither a separatory funnel nor pipette is available, simply transfer the solution into a squirt bottle. This will help ensure a clean solution. When the solution level is below the straw in the squirt bottle, discard the remaining solution in a proper waste receptacle.
- 6.11.6.3.8. When not in use, protect from direct light to preserve the shelf life of the solution.

6.11.7. Hazards/Safety:

- 6.11.7.1. Ninhydrin – [Irritant](#).
- 6.11.7.2. Methanol – [Poison](#). [Flammable](#). [Irritant](#). May cause fetal defects.
- 6.11.7.3. Isopropanol/2-propanol – [Flammable](#). [Irritant](#).
- 6.11.7.4. Petroleum ether – [Flammable](#). [Irritant](#). [Carcinogen](#).
- 6.11.7.5. Acetone – [Flammable](#). [Irritant](#).
- 6.11.7.6. HFE-7100 – [Irritant](#).
- 6.11.7.7. Ethanol-[Flammable](#). [Irritant](#). [Poison](#). May cause fetal defects.
- 6.11.7.8. Ethyl Acetate-[Flammable](#). [Irritant](#)
- 6.11.7.9. Glacial Acetic Acid- Severe [irritant](#); may cause burns. [Flammable](#). [Corrosive](#).
- 6.11.7.10. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.11.8. Reference Materials/Controls/Calibration Checks:

- 6.11.8.1. Testing of Ninhydrin is performed prior to each use.
- 6.11.8.2. An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a purple print) has been conducted and documented in the analyst's case notes.
- 6.11.8.3. The area surrounding the intentionally deposited latent print shall serve as a negative control.

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6.11.9. Procedures/Instructions:

- 6.11.9.1. Spray, dip, or paint the working solution onto the item(s) to be processed.
- 6.11.9.2. Allow the item(s) to dry.
- 6.11.9.3. Place in a humidity chamber with the dry bulb temperature at approximately 80°C and the wet bulb temperature at approximately 70°C for approximately 20 minutes.
- 6.11.9.4. If an oven is not available, a steam iron may be used. The steam iron should be held approximately 1 to 2 inches above the surface. Never allow the steam iron to touch the item as accidental contact will result in excessive discoloration.
- 6.11.9.5. Developed prints are evaluated to determine their suitability for comparison.
- 6.11.9.6. Prints deemed to be suitable for comparison are marked and then photographed or scanned as soon as possible as developed prints may fade over time and may not be retrievable with reprocessing.

6.12. Oil Red O

6.12.1. Scope: Oil Red O is used to develop latent prints on porous surfaces. Oil Red O reacts with water insoluble lipids and lipoproteins in perspiration. When this reaction is complete, the developed latent prints will be stained a pink red color. Oil Red O is useful for documents which may become weakened or decomposed during the multiple immersion steps of the Physical developer procedure or on porous items that have been previously wet.

6.12.2. Precautions/Limitations:

- 6.12.2.1. Shelf Life:
 - 6.12.2.1.1. Stain Solution – indefinite, providing methanol does not dissolve
 - 6.12.2.1.2. Carbonate Buffer Solution – 3 to 4 months
- 6.12.2.2. This reagent will remove any printed information on thermal paper. Information written in ball point pens may become lighter. Record any important printed information prior to applying this reagent.
- 6.12.2.3. Research has shown that Oil Red O can be superior to Physical Developer to develop latent fingerprints on thermal paper and standard white paper.
- 6.12.2.4. Oil Red O is incompatible with porous items which strongly absorb the dye stain and pinkish colored documents.
- 6.12.2.5. Physical Developer may work better on brown Kraft paper.

6.12.3. Instruments/Equipment:

- 6.12.3.1. Orbital Shaker
- 6.12.3.2. Filter Paper and Funnel or Buchner Funnel with Vacuum
- 6.12.3.3. Beaker(s)
- 6.12.3.4. Graduated Cylinder(s)
- 6.12.3.5. Stir Bar(s)
- 6.12.3.6. Stir Plate(s)
- 6.12.3.7. Glass Tray(s)
- 6.12.3.8. Wash Bottle(s)
- 6.12.3.9. Dark Glass Bottle(s)

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6.12.3.10. Digital Camera or Scanner

6.12.4. Reagents/Materials:

6.12.4.1. Reagents

- 6.12.4.1.1. Oil Red O
- 6.12.4.1.2. Methanol
- 6.12.4.1.3. Sodium Hydroxide
- 6.12.4.1.4. Sodium Carbonate
- 6.12.4.1.5. Nitric Acid

6.12.4.2. Staining Solution

- 6.12.4.2.1. Dissolve 1.54g Oil Red O in 770ml Methanol.
- 6.12.4.2.2. Dissolve 9.2 g Sodium hydroxide in 230ml distilled water.
- 6.12.4.2.3. Add the Sodium hydroxide solution to the Oil Red O Solution.
- 6.12.4.2.4. Mix and filter the combined solutions.
- 6.12.4.2.5. Store staining solution in a dark brown glass bottle.

6.12.4.3. Buffer Solution

- 6.12.4.3.1. Dissolve 26.5g Sodium carbonate in 2L distilled water.
- 6.12.4.3.2. Add 18.3ml concentrated Nitric acid, stirring constantly.
- 6.12.4.3.3. Add distilled water to increase volume to 2.5L.
- 6.12.4.3.4. Store buffer solution in a dark brown glass bottle.

6.12.5. Hazards/Safety:

- 6.12.5.1. Oil Red O – [Irritant](#).
- 6.12.5.2. Methanol – [Poison](#). [Flammable](#). [Irritant](#). May cause fetal defects.
- 6.12.5.3. Sodium Hydroxide – Severe [irritant](#); may cause burns.
- 6.12.5.4. Sodium Carbonate – [Irritant](#).
- 6.12.5.5. Nitric Acid – [Oxidizer](#). [Corrosive](#). [Flammable](#). [Poison](#).
- 6.12.5.6. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.12.6. Reference Materials/Controls/Calibration Checks:

- 6.12.6.1. Testing of Oil Red O is performed prior to each use.
- 6.12.6.2. An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a pinkish-red print) has been conducted and documented in the analyst's case notes.
- 6.12.6.3. The area surrounding the intentionally deposited latent print shall serve as a negative control.

6.12.7. Procedures/Instructions:

- 6.12.7.1. Use three trays.
- 6.12.7.2. Add Stain Solution to first tray.
- 6.12.7.3. Immerse the item in stain solution and soak completely. Agitating the solution on a shaker is optional.
- 6.12.7.4. Ridge detail should begin to develop in 5 min. Weak prints may require 60-90 minutes of development.
- 6.12.7.5. Add Buffer Solution to second tray.
- 6.12.7.6. Immerse the item from the first tray in the buffer solution.

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- 6.12.7.7. Add Distilled water to third tray.
- 6.12.7.8. Rinse item from second tray with distilled water.
- 6.12.7.9. Dry Item at room temperature or heat in an oven at 50°C.
- 6.12.7.10. Developed prints are evaluated to determine their suitability for comparison.
- 6.12.7.11. Prints deemed to be suitable for comparison are marked and then photographed or scanned.

6.13. Physical Developer (PD)

6.13.1. Scope: Physical developer (PD) is used to develop latent prints on porous surfaces. PD has also been found to be highly effective in developing latent prints on paper currency or porous items that have been previously wet. Physical developer is normally applied after the DFO and/or Ninhydrin methods.

6.13.2. Precautions/Limitations:

- 6.13.2.1. Shelf Life:
 - 6.13.2.1.1. Solution 1 – Indefinite
 - 6.13.2.1.2. Solution 2 – Indefinite
 - 6.13.2.1.3. Solution 3 – up to 1 year
 - 6.13.2.1.4. Solution 4 – up to 1 year
- 6.13.2.2. To darken developed PD prints after being submerged in the redox working solution, the item of evidence can be dipped in a 1:1 dilution of Sodium hypochlorite and distilled water. The item is then rinsed with water.
- 6.13.2.3. Surfaces that need other forensic examinations, such as body fluid, trace, or questioned document examinations, should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.
- 6.13.2.4. PD interferes with DNA examinations.
- 6.13.2.5. Cleanliness is important in the PD method. A good deal of the instability can be caused by laboratory equipment that is not spotless. Some contaminants, especially salts, will cause the silver nitrate in the solution to come out of suspension thus spoiling the physical developer solution and perhaps ruining the item being examined. It is important to keep the glassware spotless and rinsed with distilled or de-ionized water prior to use. When washing glassware, use detergent, not abrasive cleaners.
 - 6.13.2.5.1. Note: Plastic wrap can be used to line the trays.

6.13.3. Instruments/Equipment:

- 6.13.3.1. Beaker(s)
- 6.13.3.2. Graduated Cylinder(s)
- 6.13.3.3. Stir Bar(s)
- 6.13.3.4. Stir Plate(s)
- 6.13.3.5. Glass Tray(s)
- 6.13.3.6. Wash Bottle(s)
- 6.13.3.7. Dark Glass Bottle(s)
- 6.13.3.8. ALS (Alternate Light Source)
- 6.13.3.9. Digital Camera or Scanner

6.13.4. Reagents/Materials:

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6.13.4.1. Reagents

- 6.13.4.1.1. Ferric Nitrate (purity 100%)
- 6.13.4.1.2. Ferrous Ammonium Sulfate (reagent grade)
- 6.13.4.1.3. Citric Acid (reagent grade)
- 6.13.4.1.4. n-Dodecylamine Acetate
- 6.13.4.1.5. Synperonic-N
- 6.13.4.1.6. Silver Nitrate (reagent grade purity $\geq 99\%$)
- 6.13.4.1.7. Maleic Acid

6.13.4.2. Stock Solutions

6.13.4.2.1. Four Solutions

6.13.4.2.1.1. Solution 1 (Maleic Acid)

- 6.13.4.2.1.1.1. Combine 25g Maleic Acid in 1000mL Distilled water on a stirring device until dissolved.

6.13.4.2.1.2. Solution 2 (Redox)

- 6.13.4.2.1.2.1. Combine 30g Ferric Nitrate, 80g Ferrous Ammonium Sulfate, 20g Citric Acid, and 1000mL Distilled water on a stirring device until dissolved.

6.13.4.2.1.3. Solution 3 (Detergent)

- 6.13.4.2.1.3.1. Combine 3g n-Dodecylamine Acetate, 4g Synperonic-N, and 1000mL Distilled water on a stirring device until dissolved.

6.13.4.2.1.4. Solution 4 (Silver Nitrate)

- 6.13.4.2.1.4.1. Combine 200g Silver Nitrate with 1000mL Distilled water on a stirring device until dissolved.

6.13.4.3. Redox Working Solution

- 6.13.4.3.1. Place Solution 2 in a beaker on a stir plate.
- 6.13.4.3.2. In this order, add Solutions 3 and 4 to Solution 2.
- 6.13.4.3.3. Stir for 3-5 minutes.

6.13.5. Hazards/Safety:

- 6.13.5.1. Ferric Nitrate (purity 100%) – [Oxidizer](#). Severe [irritant](#); may cause burns.
- 6.13.5.2. Ferrous Ammonium Sulfate (reagent grade) – [Irritant](#).
- 6.13.5.3. Citric Acid (reagent grade) – [Irritant](#).
- 6.13.5.4. n-Dodecylamine Acetate – [Irritant](#). Toxic to aquatic animals.
- 6.13.5.5. Synperonic-N – [Irritant](#).
- 6.13.5.6. Silver Nitrate (reagent grade purity $\geq 99\%$) – [Oxidizer](#). Severe [irritant](#); may cause burns.
- 6.13.5.7. Maleic Acid – [Corrosive](#). Severe [irritant](#); may cause burns.
- 6.13.5.8. Refer to the Material Safety Data Sheet (MSDS) for more information.

6.13.6. Reference Materials/Controls/Calibration Checks:

- 6.13.6.1. Testing of PD is performed prior to each use.

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6.13.6.2. An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a grey print) has been conducted and documented in the analyst's case notes.

6.13.6.3. The area surrounding the intentionally deposited latent print shall serve as a negative control.

6.13.7. Procedures/Instructions:

6.13.7.1. Use three glass trays (these trays shall be spotless and should be designated specifically for Physical Developer) and plastic or wood tongs.

6.13.7.2. Add Maleic Acid Solution 1 to first glass tray.

6.13.7.3. Submerge item of evidence for 5 minutes. Bubbling action must cease.

6.13.7.4. Add Redox Working Solution to second glass tray on a shaker.

6.13.7.5. Submerge item of evidence from first tray in the Redox Working Solution for 5 to 15 minutes.

6.13.7.6. Add water to third glass tray.

6.13.7.7. Rinse item of evidence from second tray with water in the third tray to remove excess solution.

6.13.7.8. Dry item of evidence by air drying or apply heat from a dry iron.

6.13.7.9. Developed prints are evaluated to determine their suitability for comparison.

6.13.7.10. Prints deemed to be suitable for comparison are marked and then photographed or scanned.

6.14. R.A.Y. Dye Stain

6.14.1. Scope: R.A.Y. Dye Stain is a mixture of Rhodamine 6 dye, Basic Yellow 40 dye, and Ardrex P133D. It is a fluorescent dye stain used on nonporous items to enhance Cyanoacrylate developed latent prints.

6.14.2. Precautions/Limitations:

6.14.2.1. Shelf Life: 6 months

6.14.2.2. Avoid excess build-up of Cyanoacrylate as this may result in ridge detail depicting little contrast to the strongly fluorescent surface.

6.14.2.3. Surfaces that absorb too much of the dye stain will fluoresce, resulting in diminished contrast between the ridge detail and the fluorescent surface.

6.14.3. Instruments/Equipment:

6.14.3.1. Beaker(s)

6.14.3.2. Graduated Cylinder(s)

6.14.3.3. Stir Bar(s)

6.14.3.4. Stir Plate(s)

6.14.3.5. Glass Tray(s)

6.14.3.6. Wash Bottle(s)

6.14.3.7. Dark Glass Bottle(s)

6.14.3.8. ALS (Alternate Light Source)

6.14.3.9. Digital Camera

6.14.3.10. Camera Filters

6.14.4. Reagents/Materials:

6.14.4.1. Reagents

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- 6.14.4.1.1. Basic Yellow 40 dye
- 6.14.4.1.2. Glacial Acetic Acid
- 6.14.4.1.3. Rhodamine 6 dye
- 6.14.4.1.4. Ardrex P133D
- 6.14.4.1.5. Isopropanol or denatured Ethanol
- 6.14.4.1.6. Acetonitrile
- 6.14.4.2. Working Solution
 - 6.14.4.2.1. Combine 0.5g Basic Yellow 40, 10mL Glacial Acetic Acid, 0.05g Rhodamine 6, 4mL Ardrex, 450mL Isopropanol or denatured Ethanol, and 40mL Acetonitrile in this exact order.
 - 6.14.4.2.2. Place on a stir plate until everything is dissolved.
- 6.14.5. Hazards/Safety:
 - 6.14.5.1. Basic Yellow 40 dye – [Irritant](#).
 - 6.14.5.2. Glacial Acetic Acid – Severe [irritant](#); may cause burns. [Flammable](#). [Corrosive](#).
 - 6.14.5.3. Rhodamine 6 dye – Possible [carcinogen](#). [Irritant](#).
 - 6.14.5.4. Ardrex P133D – [Irritant](#).
 - 6.14.5.5. Isopropanol/2-propanol – [Flammable](#). [Irritant](#).
 - 6.14.5.6. Denatured Ethanol – [Flammable](#). [Irritant](#). [Poison](#). May cause fetal defects.
 - 6.14.5.7. Acetonitrile – [Flammable](#). [Irritant](#). May cause fetal defects.
 - 6.14.5.8. Use ultra-violet protection goggles when working with ultra-violet light sources.
 - 6.14.5.9. Refer to the Material Safety Data Sheet (MSDS) for more information.
- 6.14.6. Reference Materials/Controls/Calibration Checks:
 - 6.14.6.1. Testing of R.A.Y. Dye Stain is performed prior to each use.
 - 6.14.6.2. An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a fluorescent orange print) has been conducted and documented in the analyst's case notes.
 - 6.14.6.3. The area surrounding the intentionally deposited latent print shall serve as a negative control.
- 6.14.7. Procedures/Instructions:
 - 6.14.7.1. Spray, dip, brush, or use a squirt bottle to apply the R.A.Y. Dye Stain.
 - 6.14.7.2. Rinse with cold tap water.
 - 6.14.7.3. Allow the items to dry thoroughly.
 - 6.14.7.4. Examine the items under a Laser or Alternate Light Source at 450nm to 550nm with an orange or yellow filter.
 - 6.14.7.5. Developed prints are evaluated to determine their suitability for comparison.
 - 6.14.7.6. Prints deemed to be suitable for comparison are marked and then photographed using the appropriate barrier filter.

7. Hazard/Safety Definitions:

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- 7.1. **Irritant:** a substance which on immediate, prolonged, or repeated contact with normal living tissue will induce a local inflammatory reaction.
- 7.2. **Flammable:** any liquid having a flash point below 100 deg. F. (37.8 deg. C.), except any mixture having components with flash points of 100 deg. F. (37.8 deg. C.) or higher, the total of which make up 99 percent or more of the total volume of the mixture.
- 7.3. **Corrosive:** a material that is a highly reactive substance that causes obvious damage to living tissue. Corrosives act either directly, by chemically destroying the part (oxidation), or indirectly by causing inflammation. Acids and bases are common corrosive materials. Corrosives such as these are also sometimes referred to as caustics.
- 7.4. **Poison:** a substance that adversely affects one's health by causing injury, illness, or death.
- 7.5. **Carcinogen:** a substance that causes cancer (or is believed to cause cancer). Use extreme caution when working with carcinogenic (or potentially carcinogenic) materials in the workplace. Be sure to use all proper personal protective equipment (PPE) and to minimize your exposure.
- 7.6. **Oxidizer:** a substance that can cause other materials to combust more readily (or upon contact!) or make fires burn more fiercely. Always store oxidizers away from flammable or combustible materials as well as sources of heat, flame or sparks. Be sure to examine the MSDS and label carefully to determine which materials are incompatible.

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APPENDIX 9 INSTRUMENT CALIBRATION CHECK AND MAINTENANCE

All laboratory instruments that are critical for testing shall be maintained in a manner that ensures proper calibration and working order. According to Indiana State Police Laboratory Quality Assurance Manual, a record of repair, maintenance, and calibration check related activities shall be maintained for each laboratory instrument critical to testing. Anytime equipment is returned from being serviced or repaired, a performance check shall be completed and recorded on the Instrument Maintenance Log (see [Appendix 7](#)).

1. AFIS

- 1.1. To ensure that the AFIS is working properly, a test print shall be searched quarterly.
- 1.2. Once the scan is completed, the AFIS Performance Test Log (see [Appendix 7](#)) shall be filled out by the analyst. The log shall include the date the check was completed, who completed the check, and if the system was working properly (the known candidate was on the candidate list).
- 1.3. If the known candidate does not appear on the candidate list, an additional search shall be done. If the known candidate still does not appear, a Unit Supervisor shall be notified, and a service call shall be made to the AFIS Help Desk.
 - 1.3.1. The terminal shall be taken offline and labeled "out of service," and all users shall be notified.
 - 1.3.2. Actions taken to repair or correct the problem shall be documented on the Instrument Maintenance Log (see [Appendix 7](#)).

2. Alternate Light Source (ALS)

- 2.1. Refer to the Processing Manual ([Appendix 8](#)).

3. Balances/Scales

- 3.1. Each balance/scale shall be cleaned, serviced, and certified annually by a reputable outside agency. This record of certification shall be kept by the balance/scale and the date the certification was completed shall be recorded in the calibration check log (see [Appendix 7](#)).
- 3.2. Each balance/scale shall be checked every 6 months using a set of weights for reference. The allowable deviation from the standard weights is +/-0.1g of the standard weight being used for the calibration check. If the balance/scale fails the check, the check shall be repeated. If the balance/scale still fails, a Unit Supervisor or Laboratory Manager shall be notified.
 - 3.2.1. The balance shall be labeled "out of service" and all users notified.
 - 3.2.2. If necessary, technical support shall be sought and/or the equipment shall be repaired before being placed back into operation.
 - 3.2.3. Actions taken to repair or correct the problem shall be documented in the Instrument Maintenance Log (see [Appendix 7](#)).

4. Cyanoacrylate Fuming Cabinet

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- 4.1. The main carbon filter in each cabinet shall be changed annually per the manufacturer's recommendation and recorded in each cabinet's filter log (see [Appendix 7](#)).
- 4.2. The pre-filter in each cabinet shall be changed when it is discolored and recorded on each cabinet's filter log (see [Appendix 7](#)).
 - 4.2.1. At a minimum, the pre-filter in each cabinet shall be changed annually.
- 4.3. The humidifier filters shall be changed as signs of use become visible and recorded in each cabinet's filter log (see [Appendix 7](#)).
- 4.4. When a problem is noted with a Cyanoacrylate Fuming Cabinet, a Unit Supervisor or Laboratory Manager shall be notified.
 - 4.4.1. The Cyanoacrylate Fuming Cabinet shall be labeled "out of service" and all users notified.
 - 4.4.2. If necessary, technical support shall be sought and/or the equipment shall be repaired before being placed back into operation.
 - 4.4.3. Actions taken to repair or correct the problem shall be documented in the Instrument Maintenance Log (see [Appendix 7](#)).

5. Chemical Exhaust Hoods

- 5.1. Chemical Exhaust Hoods shall be maintained according to the Indiana State Police Laboratory Safety Manual.

6. Digital Cameras

- 6.1. General camera maintenance consists of wiping camera bodies with a soft cloth, blowing off lenses and mirrors to remove dust or dirt, and then cleaning with a soft cloth or eyeglass cleaner.
- 6.2. When a problem is noted with a Digital Camera, a Unit Supervisor or Laboratory Manager shall be notified.
 - 6.2.1. The Digital Camera shall be labeled "out of service" and all users notified.
 - 6.2.2. If necessary, technical support shall be sought and/or the equipment shall be repaired before being placed back into operation.
- 6.3. Actions taken to repair or correct the problem shall be documented in the Instrument Maintenance Log (see [Appendix 7](#)).

7. Digital Imaging Equipment

- 7.1. To ensure that the Digital Imaging equipment is working properly, a test shall be performed annually on the digital imaging computer that stores SICAR. This is to ensure that all scanners, printers, and image calibration software are working properly together.
 - 7.1.1. A ruler/scale shall be scanned into the Digital Imaging System or the analyst shall use the digital image of the scale stored within Mideo for performance checks. It is recommended that a standard 2mm adhesive scale that has been checked against a certified ruler/scale be utilized and that the same scale is used for each check.
 - 7.1.2. The ruler/scale shall then be calibrated using the image calibration software within Mideo Workspace. The image calibration software resizes the captured image to bring it to an original 1:1 size. The resizing is not a critical measurement for Latent Print analysis, and discrepancies of 5% (1mm per 2cm) are within tolerance.

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- 7.1.3. This calibrated image of a ruler/scale shall be printed out in Adobe Photoshop and compared to the ruler/scale that was scanned. Once this is done, the printout shall be initialed and dated by the analyst, and retained.
 - 7.1.3.1. If the imaged scale is out of tolerance with the original scale, a Unit Supervisor shall be notified. The equipment shall be taken offline and labeled "out of service," and all users shall be notified.
 - 7.1.3.2. Actions taken to repair or correct the problem shall be documented on the Instrument Maintenance Log (See [Appendix 7](#)).
- 7.2. When a problem is noted with a particular piece of equipment, software program, etc., the Digital Imaging System Administrator and/or a Unit Supervisor shall be notified.
 - 7.2.1. The equipment shall be taken offline and labeled "out of service," and all users shall be notified.
 - 7.2.2. If necessary, technical support shall be sought and/or the equipment shall be repaired before being placed back into operation.
 - 7.2.3. Actions taken to repair or correct the problem shall be documented in the Instrument Maintenance Log (see [Appendix 7](#)).
- 7.3. When an update to a version of digital software occurs, this shall be recorded in the Instrument Maintenance Log (see [Appendix 7](#)).

8. Eyewashes and Showers

- 8.1. Eyewash and shower stations shall be maintained according to the Indiana State Police Laboratory Safety Manual.

9. Heat/Humidity Chamber

- 9.1. If a heat/humidity chamber is not working properly, the drain and water reservoir shall be checked. Refer to the manufacturer's instruction manual for details.
 - 9.1.1. If the problem cannot be resolved, a Unit Supervisor and Laboratory Manager shall be notified.
 - 9.1.2. The hood shall be labeled "out of service" and all users notified.
 - 9.1.3. If necessary, technical support shall be sought and/or the equipment shall be repaired before being placed back into operation.
 - 9.1.4. Actions taken to repair or correct the problem shall be documented in the Instrument Maintenance Log (see [Appendix 7](#)).

10. Laser

- 10.1. Refer to the Processing Manual ([Appendix 8](#)).

11. Reference Standards (Ruler and Weights)

- 11.1. Certified rulers shall be kept in a safe place to prevent bending or scratching and shall not be transported out of the laboratory.
- 11.2. Weights used to check the balance(s) shall be kept in a restricted access area of the laboratory and shall not be transported out of the laboratory. Weights shall be kept away from damp areas. Gloves shall be worn when handling and using the weights.

12. RUVIS

- 12.1. Refer to the Processing Manual ([Appendix 8](#)).

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13. Shoeprint Image Capture and Retrieval (SICAR)/Tread Assistant

- 13.1. To ensure that the SICAR/Tread Assistant is working properly, a test impression shall be searched prior to using the software for each case. The test impression is one that is known to be in the database.
- 13.2. Once the search is completed, the performance check, which shall include the date with a pass/fail result, will be recorded in the analyst's case notes.
 - 13.2.1. If the known shoe/tire does not appear on the candidate list, an additional search shall be done. If the known shoe/tire still does not appear, a SICAR/Tread Assistant Administrator and/or Unit Supervisor shall be notified.
 - 13.2.2. The software shall be taken offline and labeled "out of service," and all users shall be notified.
 - 13.2.3. Actions taken to repair or correct the problem shall be documented on the Instrument Maintenance Log (see [Appendix 7](#)).
- 13.3. When an update to a version of software occurs, this shall be recorded in the Instrument Maintenance Log (see [Appendix 7](#)).

14. Table-top Exhaust Hoods

- 14.1. Air Science manufactured models
 - 14.1.1. The main carbon filter in each hood shall be changed annually and this shall be recorded on each hood's filter log.
 - 14.1.2. The pre-filter in each cabinet shall be changed when it is saturated and this shall be recorded on each hood's filter log (see [Appendix 7](#)).
 - 14.1.2.1. At a minimum, the pre-filter in each hood shall be changed annually.
- 14.2. AirClean; AirClean 4000 Workstation model
 - 14.2.1. Due to the low use of this chamber, the main carbon filter in each hood shall be changed every fourth time the pre-filter is changed and this shall be recorded in each hood's filter log.
- 14.3. The pre-filter in each hood shall be checked every three months and this shall be recorded in each hood's filter log.
- 14.4. When a problem is noted with a hood, a Unit Supervisor and Laboratory Manager shall be notified.
 - 14.4.1. The hood shall be labeled "out of service" and all users notified.
 - 14.4.2. If necessary, technical support shall be sought and/or the equipment shall be repaired before being placed back into operation.
 - 14.4.3. Actions taken to repair or correct the problem shall be documented in the Instrument Maintenance Log (see [Appendix 7](#)).

15. UV Crosslinker

- 15.1. The UV sensor should be cleaned regularly with a soft cloth and alcohol.
- 15.2. Use soap and water with a soft cloth or sponge to clean the unit. Do not allow any water or chemicals to remain on unit surfaces.
- 15.3. When a problem is noted with a Crosslinker, a Unit Supervisor and Laboratory Manager shall be notified.
 - 15.3.1. The unit shall be labeled "out of service" and all users notified.
 - 15.3.2. If necessary, technical support shall be sought and/or the equipment shall be repaired before being placed back into operation.

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15.3.3. Actions taken to repair or correct the problem shall be documented in the Instrument Maintenance Log (see [Appendix 7](#)).

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APPENDIX 10 Hazardous Chemical Waste Management

1. Hazardous Chemical Waste

- 1.1.** A hazardous waste is defined by the Resource Conservation and Recovery Act (RCRA) as a solid waste that because of its quantity; concentration; or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in serious; irreversible; or incapacitating, reversible illnesses or pose a substantial present or potential hazard to human health, safety or welfare to the environment when improperly treated, stored, transported, used, or disposed of or otherwise managed.

1.1.1. Types of Wastes

1.1.1.1. Listed Wastes

- 1.1.1.1.1.** F-list (non-specific source wastes) – wastes from non-specific sources
 - 1.1.1.1.2.** K-list (source-specific wastes) – wastes specific industries, such as oil refining or pesticide manufacturing. The K-list is not-applicable to the Laboratory Division.
 - 1.1.1.1.3.** P-list and U-list (discarded commercial chemical products) – wastes include specific commercial chemical products in an unused form.
- 1.1.1.2. Characteristic Wastes**
- 1.1.1.2.1.** Ignitability – ignitable wastes can create fires under certain conditions, are spontaneously combustible, or have a flash point less than 60°C (140°F).
 - 1.1.1.2.2.** Corrosivity – corrosive wastes include highly acidic and highly alkaline chemicals and those that are capable of corroding metal.
 - 1.1.1.2.2.1.** If a waste exhibits ONLY the characteristic of corrosivity and is NOT a listed waste, it may be neutralized to within a pH range of 5 to 9 before disposal to a sanitary sewer.
 - 1.1.1.2.2.2.** Reactivity – reactive wastes are unstable under “normal” conditions, but can cause explosions, toxic fumes, gases, or vapors when heated, compressed, or mixed with water.
 - 1.1.1.2.2.3.** Toxicity – a solid waste that fails the Toxicity Characteristic Leaching Procedure (TCLP) because of the presence of certain heavy metals or organic constituents above regulated levels display the characteristic of toxicity and is considered a hazardous waste.

2. Hazardous Chemical Waste Containers

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- 2.1.** Hazardous chemical waste containers are commonly referred to as satellite containers.
- 2.2.** Satellite containers must be compatible with the substance they contain. Glass or Nalgene jars are appropriate for most wastes. The amber colored 4 liter or 1 liter solvent bottles are preferred because they are non-recyclable and are compatible with most types of wastes.
 - 2.2.1.** All satellite containers must have securely fitting lids or caps and be stored with the lids or caps closed.
 - 2.2.2.** Funnels shall be removed and not left in the satellite containers.
 - 2.2.3.** Satellite containers shall be marked "Hazardous Waste".
 - 2.2.4.** Depending upon the procedures set forth at the regional laboratories, full satellite containers should be moved to the Central Waste Accumulation Storage Area within three days of being filled to capacity.
 - 2.2.5.** The labels affixed to the satellite containers should contain the contents of the container.
- 3.** Storage of Hazardous Chemical Waste Containers (satellite containers)
 - 3.1.** Storage area of satellite containers for the individual laboratories will be determined based on the available room, but must be placed next to or near the process that generates the hazardous waste.
- 4.** Recommendations for Labeling Hazardous Chemical Waste Containers
 - 4.1.** Each satellite container should have a label affixed to it that specifies the contents of the container.
 - 4.1.1.** Container for highly flammables:
 - 4.1.1.1.** Chemical contents: Methanol, Glacial Acetic Acid, and Acetone
 - 4.1.1.2.** Latent Print processing solutions: Amido Black (Methanol base), Ninhydrin (Acetone base), Coomassie Blue, Coomassie Blue rinse, Amido Black (water base – Fischer 98), DFO (HFE-7100 base), and Ninhydrin (HFE-7100 base)
 - 4.1.2.** Container for heavy metals:
 - 4.1.2.1.** Chemical contents: Silver Nitrate and Ferric Nitrate
 - 4.1.2.2.** Latent Print processing solution(s): Physical Developer
 - 4.1.3.** Container for strong acids:
 - 4.1.3.1.** Chemical contents: Nitric Acid
 - 4.1.3.2.** Latent Print processing solution(s): Oil Red O buffer
 - 4.1.4.** Container for Hydrochloric Acid:
 - 4.1.4.1.** Chemical contents: Hydrochloric Acid
 - 4.1.4.2.** Latent Print processing solution(s): Hydrochloric Acid
 - 4.1.5.** Container for strong base:
 - 4.1.5.1.** Chemical contents: Methanol, Sodium Hydroxide
 - 4.1.5.2.** Latent Print processing solution(s): Oil Red O working solution
 - 4.1.6.** Container for D-list flash point:
 - 4.1.6.1.** Chemical contents: Xylene substitute
 - 4.1.6.2.** Latent Print processing solution(s): Xylene solution
 - 4.1.7.** Container for volatile, highly flammable:
 - 4.1.7.1.** Chemical contents: Petroleum Ether

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- 4.1.7.2. Latent Print processing solution(s): DFO (Petroleum Ether base), Ninhydrin (Petroleum Ether base), Ardrex, Rhodamin 6G
 - 4.1.8. Container for highly flammable:
 - 4.1.8.1. Chemical contents: Isopropanol, Acetonitrile, Glacial Acetic Acid
 - 4.1.8.2. Latent Print processing solution(s): RAY dye stain
- 5. Ridding of Hazardous and Non-Hazardous Chemical Wastes and Containers
 - 5.1. Hazardous Chemical Waste
 - 5.1.1. Hazardous Chemical Waste shall not be disposed of by rinsing the chemicals down the drain.
 - 5.1.2. When processing with a chemical that has been defined as a Hazardous Chemical Waste, the waste needs to be collected in a catch container and then the catch container emptied into the appropriate satellite container.
 - 5.2. Non-Hazardous Chemical Waste
 - 5.2.1. Most liquid chemical waste will need to be handled as hazardous chemical waste. However, you might have some non-hazardous waste that can be flushed to the sewer after twenty times (20X) dilution with water.
 - 5.2.2. Any volume of chemicals poured into the sewer/down the drain must be followed by at least twenty times (20X) volume of water.
 - 5.3. Satellite Containers
 - 5.3.1. When adding waste to a container, do not completely fill the container. Leave space for the contents to expand. Containers and chemicals may expand or contract based on temperature.
 - 5.3.2. Transfer of hazardous chemical waste from one satellite container to another satellite container is not recommended.
 - 5.3.3. The date the satellite container is filled shall be documented on the bottle.
 - 5.3.4. Depending upon the procedures set forth at the regional laboratories, the full satellite container should be moved from the Satellite Waste Accumulation Area to the Central Waste Accumulation Area within three days of the date documented on the bottle.